



# Field Diagnostics

## Field Service Tools

**SA Mobile Application**  
**Service Assistant Tool**

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## Objectives and Approach

- **OBJECTIVE:** Sustained performance of unitary HVAC equipment for:
  - Reliable comfort
  - Lower operating costs
    - Energy
    - Unplanned service
    - Capital - equipment replacements
- **APPROACH**
  - Maintaining “as designed” performance
  - Upgrading technology and replacing units when appropriate
  - Addressing distribution system and envelope problems when needed
  - Addressing adjacent issues (e.g. lighting controls) as needed

# Problem Solving Approach

**Collect  
Enterprise  
Level Data**

- EMS Data
- Occupancy Schedules
- Utility Bill History
- Power Consumption
- Weather Data



*Provide Foundation  
For Assessing  
Performance*

**Analyze  
and  
Report**

- ID Data Quality Issues
- Analyze Energy Usage
- Identify Faults
- Provide Diagnostics
- ID Control Opportunities



*Assess Performance  
And  
Prioritize Problems*

**Drive  
Prioritized  
Solutions**

- Manage Service
- Utility Incentives
- Load Shifting
- Demand Response
- Control Peak Demand



*Condition  
Based  
Solutions*

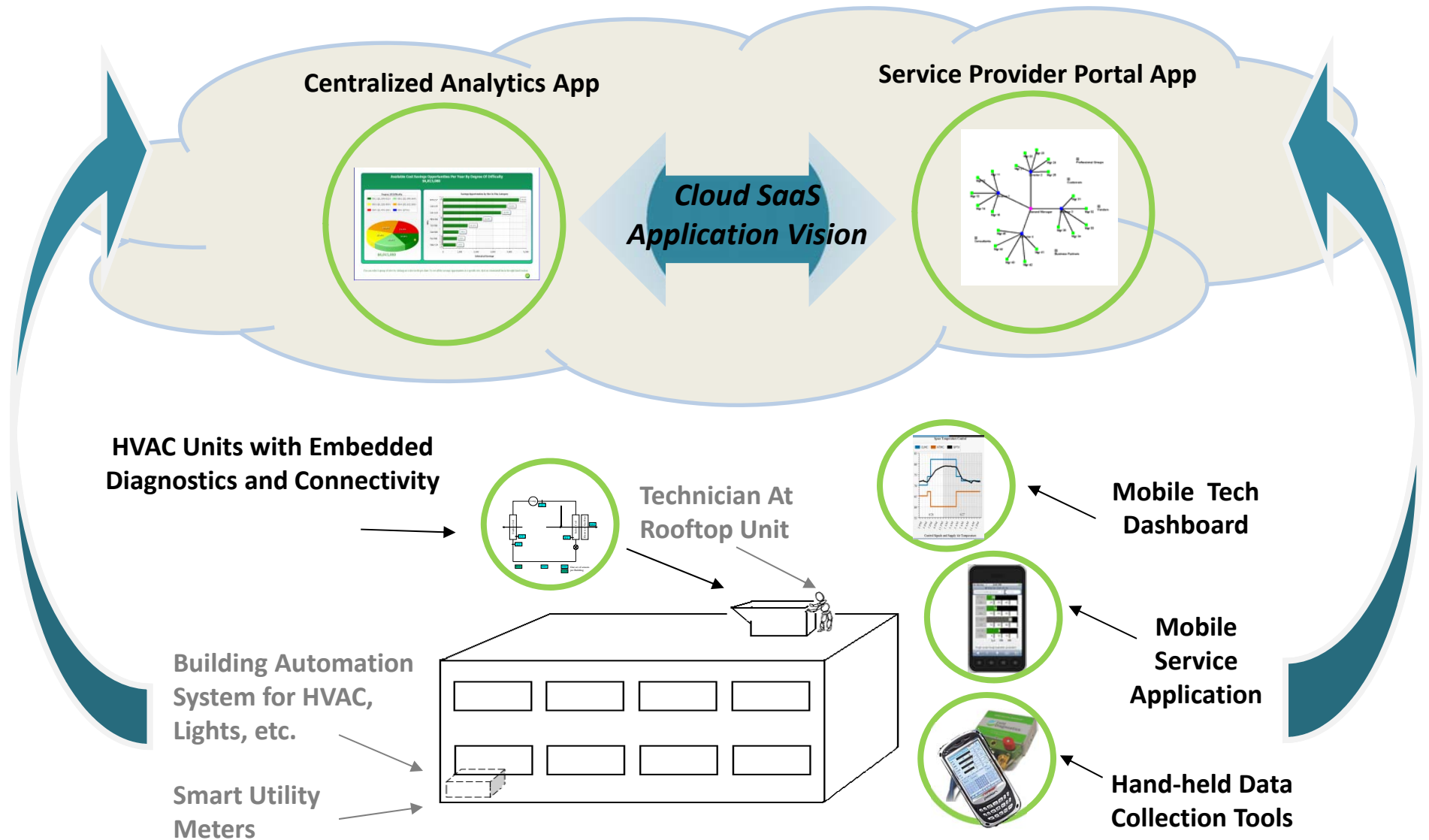
**Report  
Achieved  
Savings**

- Customer Reports
- Controls Optimization
- Utility Expenses
- Capital Equipment
- Visibility to Costs



*Quantify  
Achieved  
Benefits*

# Building Performance Technology Suite



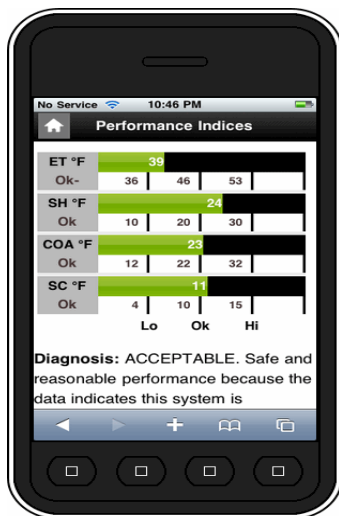
## Process and Tools

Process Step	Embedded Analytics	Field Service Analytics
<b>Identify and Prioritize Opportunities</b>	- Analyze utility, EMS and embedded diagnostic data at enterprise-level	- Survey buildings and units to assess opportunities
<b>Drive solutions</b>		<ul style="list-style-type: none"> <li>- Process standardization</li> <li>- Collect field service observations</li> <li>- Diagnostics based on field collected data (Service Assistant)</li> </ul>
<b>Validate savings and other benefits</b>	- Analyze utility, EMS and embedded diagnostic data at enterprise-level	- Report achieve benefits based on before and after service data

## Service Assistant Tool



## SA Mobile Field Service Application



# Field Service Tools

## Field Service Diagnostics

Conditions		Sensors	
AMB*	85	SP*	73
RA*	70	HP*	216
RWB*	62	HP Type	
		LP	DP
		ST*	63
		LT*	97

ET(F)	43			
Ok	33	43	50	
SH(F)	20			
Ok	10	20	30	
COA(F)	22			
Ok	12	22	32	
SC(F)	10			
Ok	4	10	15	

ACCEPTABLE/No repair needed: Safe and reasonable performance because the data indicates this system is performing as expected given the conditions entered. No further system diagnostics are required.

EI %	100			
	30	60	90	120
CI %	100			
	30	60	90	120

Save

## Task Standardization

### Unit walk around

What is condition of the service disconnect?

Choose one... ▼

Check the integrity of the insulation/vapor barrier on duct & pipes, what is the as-left condition?

Choose one... ▼

Clean condenser coil using water and chemical solution, if necessary. (Do not brush clean.)

Choose one... ▼

Check the outdoor coil for damage or leaks, what is the as-left condition?

Choose one... ▼

# Key Product Requirements

- **SA Mobile**
  - Platform independent HTML 5 application
    - Primary use on Android and iOS systems
  - Responds quickly to user interactions – does not require Internet connectivity during field service use
  - Features
    - Site and HVAC unit asset management
    - Field diagnostic data collection and analysis
    - Task standardization and data collection (e.g. HVAC QM utility incentive programs)
- **Service Assistant Tool**
  - Automated refrigeration cycle diagnostic data accessory for SA Mobile
  - Accurate measurements
  - Rugged
  - Easy to use
    - Long life batteries
    - No buttons – not even power
    - Manageable sensor configuration and wiring

## Uses – Utility Incentive Programs

- Tasking for specific utility incentive program integrated into tool.  
For example:
  - ACCA 180 HVAC QM programs
    - CA - SCE, PG&E and SDG&E
    - NYSERDA
- Fully integrated refrigeration cycle data collection and analytics/diagnostics
- Data automatically uploaded to utility programs for incentive processing
- Utility and customer PM tasking requirements merged
- Consistent customer and utility reporting
- Pricing
  - Service provider purchase
  - Integrated into programmatic fee structure



## Uses – National Account PM programs

- Support quality delivery process between technician check-in and check-out >>> compliments work order and CMMS software solutions
- Supports program goals / customer pain points
  - Consistent field service process and data collection
  - Consistent portfolio reporting
  - Field service feedback - drive quality engagements and outcomes
  - Participation in utility incentive programs
- Pricing
  - Service provider purchase
  - Integrated into programmatic fee structure

## Uses – Field Service Support / Mgmt

- Service provider management uses to:
  - Support field service technician diagnostic skills
  - Manage field service force to deliver quality product
  - Participate in utility programs
- Reporting helps:
  - Communicate quality service delivery to customers – market differentiator
  - Provide support and quality control on field service technicians
- Pricing - Service provider purchases tools as company asset

## Next Generation Solutions

- Integration with embedded data systems to empower field service technicians with valuable information
  - EMS data based performance alerts
  - EMS and utility data and analysis
  - OEM diagnostic information – interface to units
- Integration into scalable SaaS solutions for small/medium commercial buildings
  - Business leaders and technical resources engage solution end-to-end without people-based program management
  - Small to medium size utilities can adopt configurable low cost standard HVAC program designs
  - National accounts can get portfolio standard solutions with broad utility incentive participation – Enables franchise participation with distributed decision making