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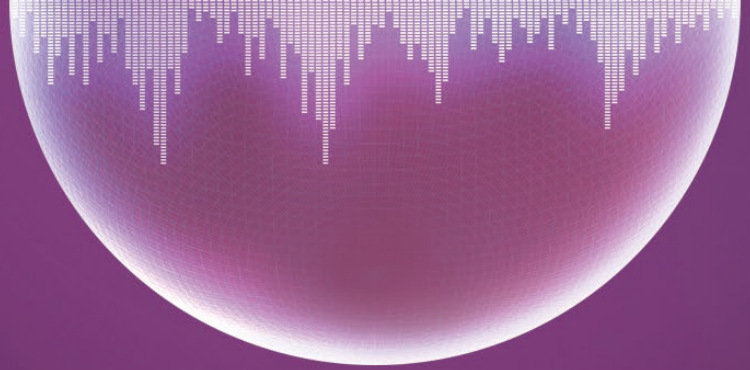

CTBTO
PREPARATORY COMMISSION

Development of Remote Station Infrastructure Monitoring Tools

S. Little, D. Bustillo, G. Kline
General Dynamics Mission Systems, USA

T4.5-378

POSTER

GENERAL DYNAMICS
Mission Systems

Development of Remote Station Infrastructure Monitoring Tools

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ABSTRACT

General Dynamics' concept of operations for US IMS stations focuses on robust state of health and remote-control capabilities of the particulate and noble gas systems, paired with local operators to monitor the station infrastructure.

However, with the COVID-19 Pandemic limiting travel for engineers to IMS stations, GDMS is improving our remote monitoring capabilities for the station infrastructure to assist our local operators. This monitoring includes:

- Automated alerting for station environmental and power issues,
- Remote-control of station equipment (HVAC units, generators, etc.);
- Stationary and portable cameras to monitor key equipment.

Through this effort, GDMS looks to provide early warning alerts on infrastructure issues, preventing future station outages.

Furthermore, by increasing these remote monitoring capabilities, GDMS can reduce the time needed to diagnose station issues, shortening outage durations. Finally, with video cameras onsite, GDMS looks to augment the capabilities of local operators by providing real-time remote support during repair efforts.

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BACKGROUND

Why the need for additional station infrastructure monitoring?

- Deep dive analysis of past evaluation of station issues/outages performed in 2020.
- Diagnosis and repair times were faster when issues originated from the particulate or noble gas systems.

System Outages

- System state-of-health (SOH) data provides a clear picture of the outage and its probable cause(s).
- Most system outages could be troubleshot and repaired remotely.
- Most system issues were only one level deep (no cascading failures in equipment).
- Required minimal on-site support to restore system operations.

Infrastructure Outages

- Infrastructure issues required “secondhand” state-of-health data to identify failure modes.
- Infrastructure failures triggered cascading system failures (power losses, over-temp shutdowns, etc.).
- Issues required onsite troubleshooting and repair (time consuming and difficult during the COVID-19 Pandemic).

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GOALS

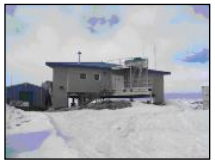
Goals

- Develop an independent, complimentary monitoring system for station infrastructure.
- Provide real-time state of health of station infrastructure:
  - Incorporate into existing GDMS sensor monitoring tools.
  - Move from preventive to predictive maintenance of station infrastructure.
- Develop a modular framework to support each station's varied needs.
- Monitoring areas:
  - Climate Control;
  - Generator;
  - Station Power;
  - Video Monitoring.
- Provide local viewing of infrastructure state-of-health for local operators.


RN70 – Sacramento, CA


RN71 – Sand Point, AK


RN72 – Melbourne, FL


RN73 – Palmer Station, Antarctica


RN74 – Ashland, KS


RN75 – Charlottesville, VA


RN76 – Fairbanks, AK


RN77 – Wake Island


RN78 – Midway Island


RN79 – Wahiawa, HI


RN80 - Guam

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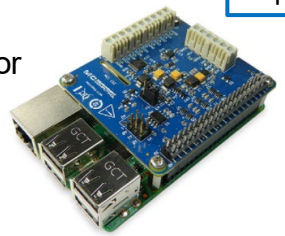
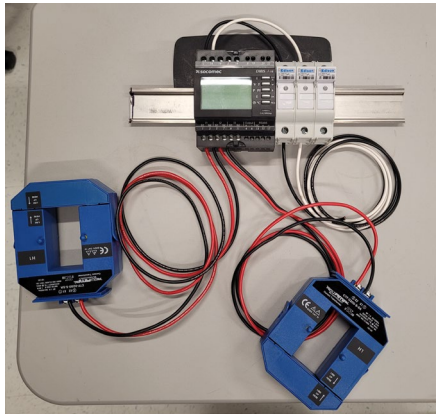
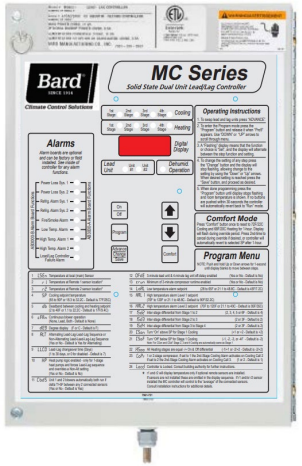
METHODS

Methods

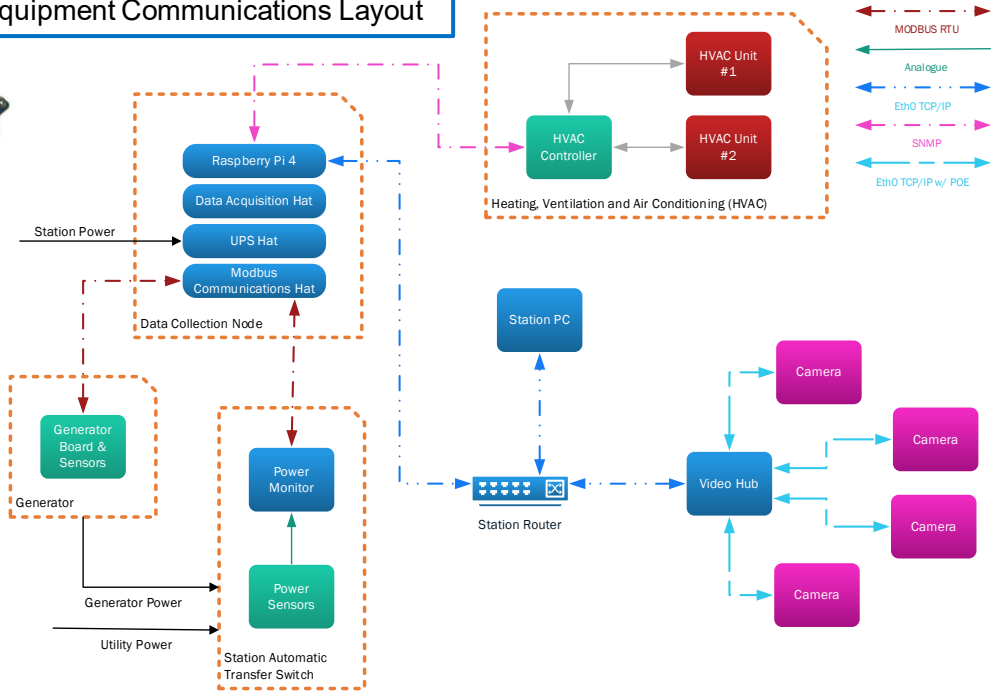
- Develop a central collection node for infrastructure state-of-health data.
- Utilize existing communications devices/protocols for infrastructure equipment.
- Provide local viewing of SOH data on the station PC.







Equipment Communications Layout



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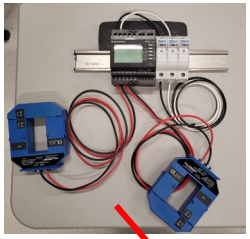
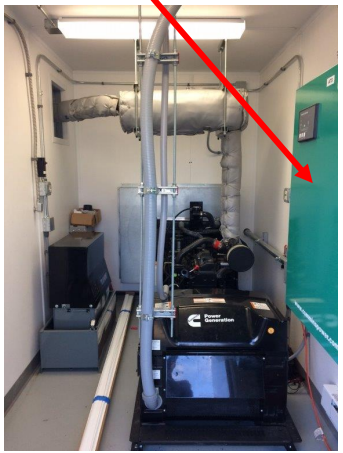
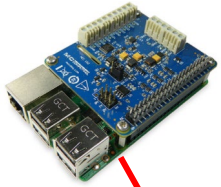
STATION LAYOUT

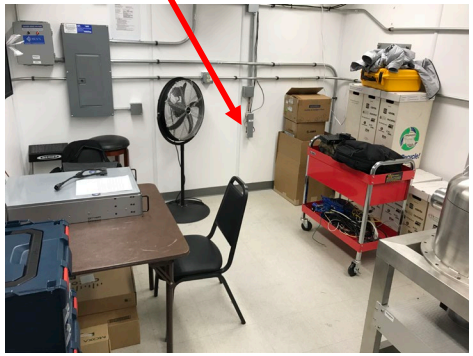
Generator Room



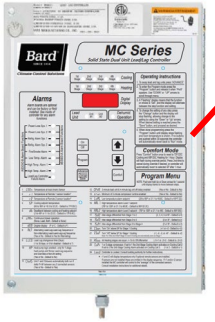


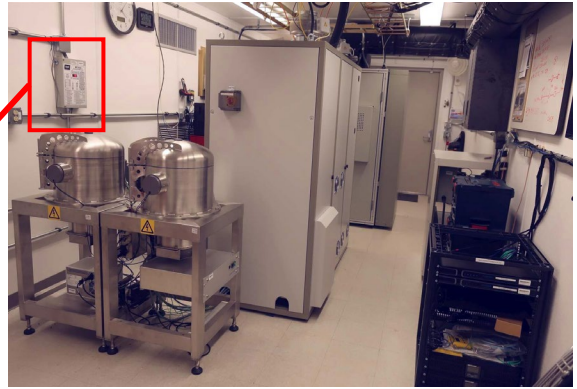
Equipment Room (view toward generator room)



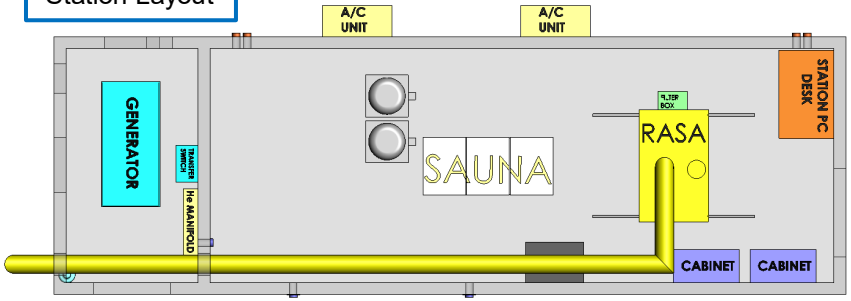


Equipment Room (view toward station entrance)





Station Layout



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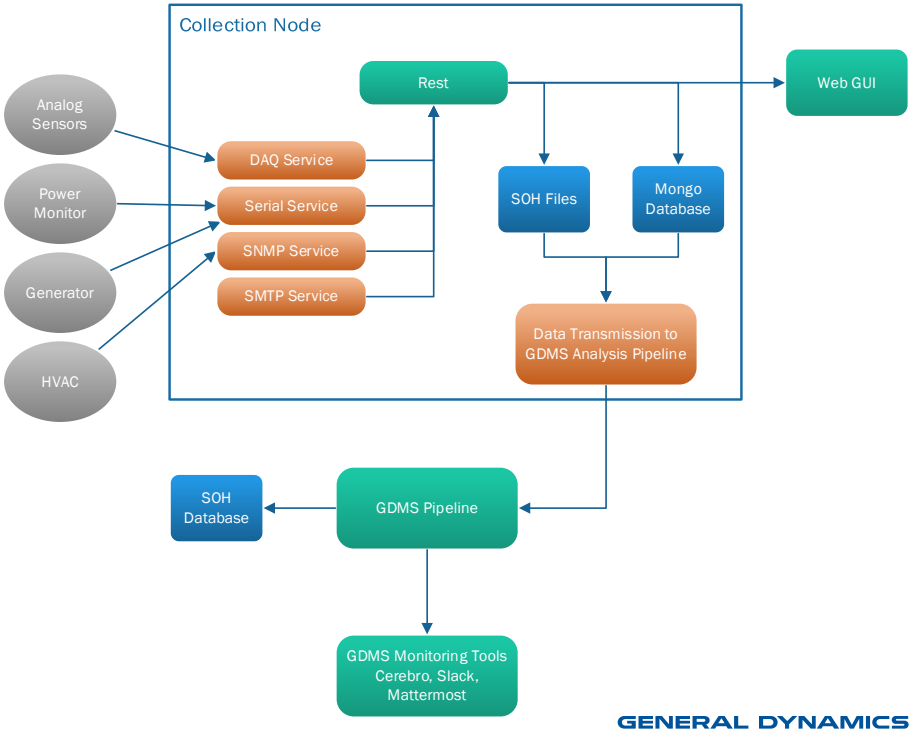
METHODS

Methods

- Setup communication services at the collection node
  - Can be added to or removed based on each station's needs
- Send SOH data to GDMS for incorporation into sensor monitoring toolsets
  - Provide real-time notification of potential station issues using existing notification platforms
- Provide remote login options for additional troubleshooting needs
- Develop a web interface for local/remote viewing of station SOH
- Locally and remotely store SOH data for trending analysis

Software Architecture



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CONCLUSIONS

Conclusions

- A station infrastructure monitoring system is in development for use across the US IMS network:
  - Designed in a modular framework to support varied station equipment/layouts;
  - Provides direct state of health data from the station support equipment, independent of the particulate or noble gas collection systems;
  - Integrates into GDMS's existing real-time alerting tools
  - Stores station SOH data for future trending and performance analysis.
- Unit testing and software integration are ongoing at GDMS, with plans to deploy the monitoring system to RN75 in Charlottesville, VA for field testing.