Advanced Wireless Communications Research

Cooperative Research and Demonstration Project

NASA Glenn and Sensis Corporation

Steve DeHart
Senior Communications Systems Engineer
Sensis Corporation

Sensis CORPORATION

Overview – Advanced Wireless Communications Research Project

Project within the NASA Glenn-Sensis Advanced CNS Testbed Program

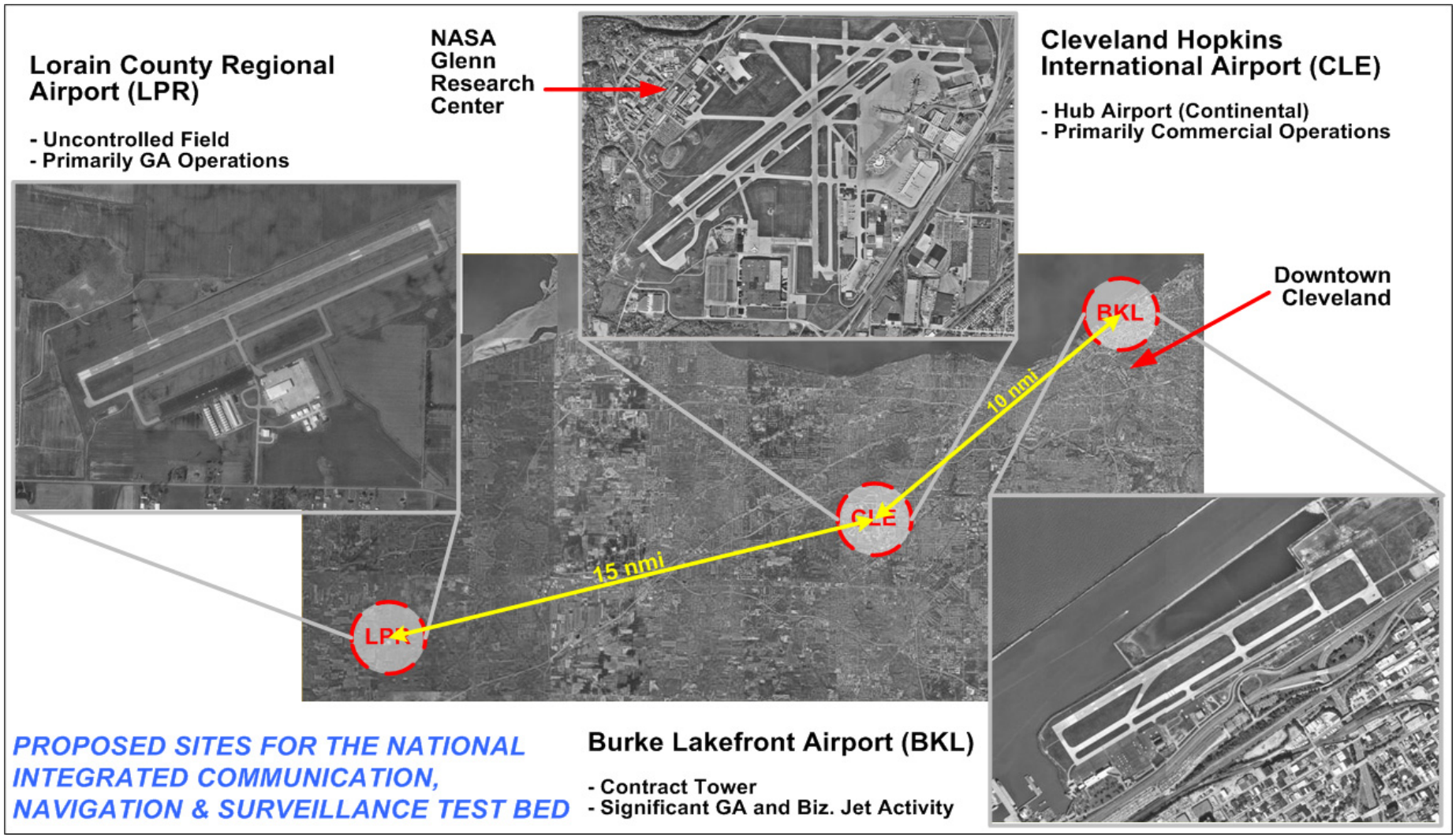
Coordinated with the ACAST Initiative

Wireless Communications Project objectives include:

- ***Prototype a secure, airport wireless communication network in the MLS band***
- ***Demonstrate utilization of the airport wireless communication network simultaneously for multiple applications including:***
  - ***surveillance data networking***
  - ***voice over IP***
  - ***asset management***
  - ***SDN/SWIM applications***

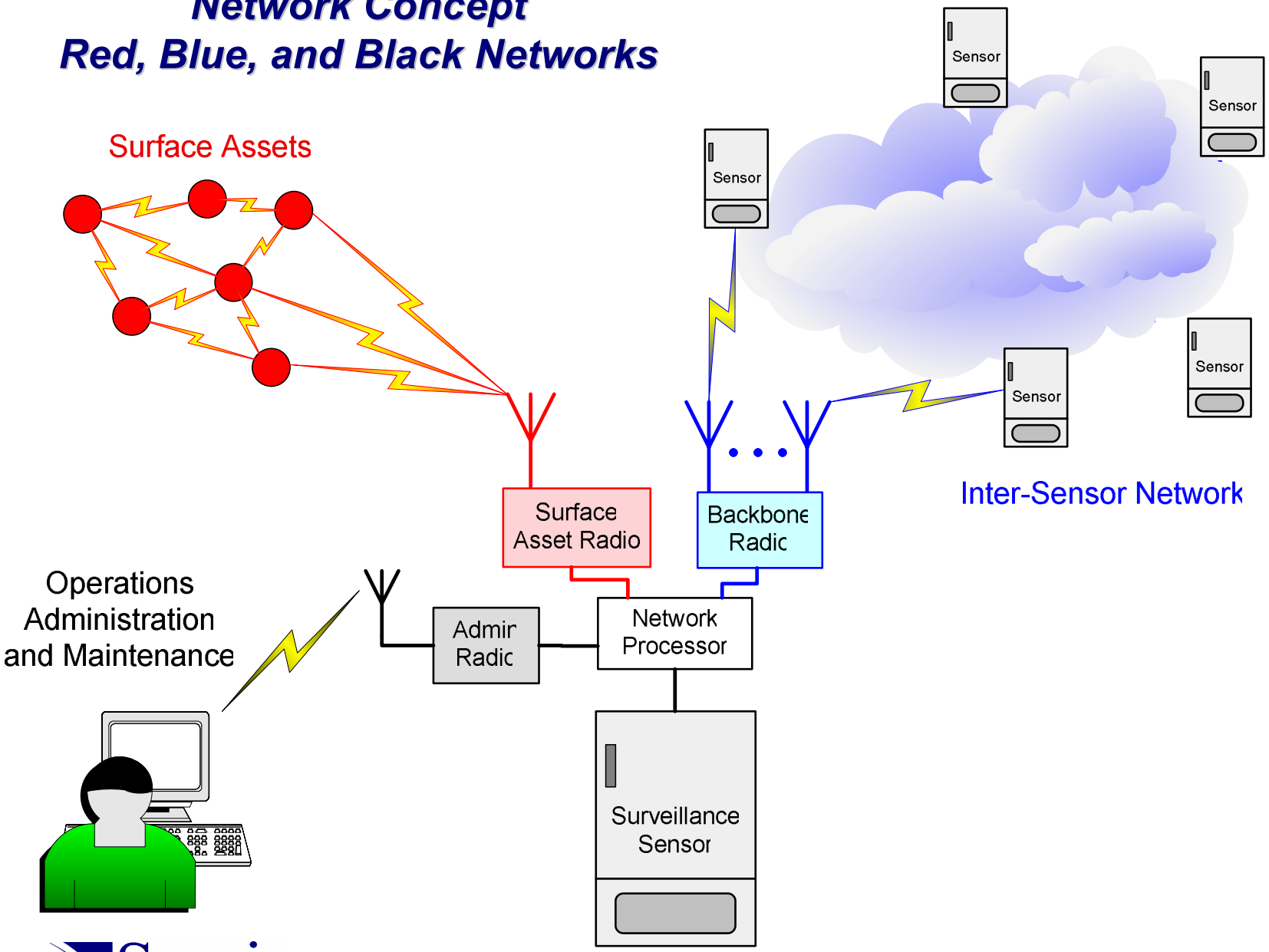
Sensis CORPORATION

Integrated Communication, Navigation & Surveillance Test Bed



Sensis CORPORATION

Network Concept
Red, Blue, and Black Networks



Sensis CORPORATION

What are the color codes?

- **BLUE Network:**
  - Mission/Safety critical data (ASDE-X and ATC sensor traffic).
  - QoS guarantees,
  - Path redundancy from each network node with rapid failover.
- **RED Network:**
  - Mobile & fixed asset communications
  - Low priority sensors (e.g. weather)
  - Surface vehicle communication & dispatch
  - Vehicle sensor data
- **BLACK Network:**
  - Failsafe network providing access Blue Network Nodes.
  - Reaches all nodes with low bandwidth link.

What is the Wireless Network Test Bed?

- ***The** Airport Surface Wireless Network Test Bed **will consist of a collection of equipment (hardware and software) that allows the simulation of a live wireless network.***
  - ***First in a Lab,***
  - ***Next in an Airport Surface environment.***

What are the Test Bed's Benefits?

- ***Radio hardware, network concepts, algorithms, can be experimented in a lab setting that accurately emulates the behavior of an actual system.***
- ***A variety of system boards, wireless technologies, and hardware can be evaluated before field deployment / trials.***
- ***A test bed allows iterative development of solutions to difficult problems.***

Test Bed Objectives

- ***Simulate link impairments and node failures and observe reliable route/path failover with minimal packet loss and induced jitter.***
- ***Simulate overloading the network with high & low priority data and observe QoS policy being executed for mission critical data.***
- ***Observe blue network behavior along side red network operations.***

Phased Research Project

--- 24 month period of performance ---

- ***Phase 1: Define a Wireless Network for Distributed Sensor Communications***

- ***Phase 2: Laboratory Implementation and Evaluation of Wireless Distributed Sensor Network***

- ***Phase 3: Deployment and Test of a Distributed Sensor System Using a Wireless Sensor Network at a Major Airport***

- ***Phase 4: Demonstration of a Wireless Sensor Network Enabled Distributed Surveillance and Operations System at a Major Airport***

Sensis CORPORATION

Phased Research Project (cont)

--- 24 month period of performance ---

- ***Phase 1: Define a Wireless Network for Distributed Sensor Communications***
  - ***Sensor Network Performance Requirements (Blue Network)***
    - *Traffic Bandwidth*
    - *QOS*
    - *Security*
    - *Path Redundancy*
  - ***Identify surface users and traffic requirements (Red Network)***
    - *Traffic types (data, voice, surveillance)*
    - *Traffic Bandwidth*
    - *Platform (fixed, mobile)*
  - ***RF spectrum***
    - *Channel Plan*
    - *Modulation*

Phased Research Project (cont)

--- 24 month period of performance ---

- ***Phase 2: Laboratory Implementation and Evaluation of Wireless Distributed Sensor Network***
  - *Build network in lab environment*
  - *Measure ATC surveillance (sensor) system performance with simulated sensor traffic*
  - *Measure ATC surveillance system performance with simulated Red Network traffic.*

- ***Phase 3: Deployment and Test of a Distributed Sensor System Using a Wireless Sensor Network at a Major Airport***
  - *Deploy Surveillance system and wireless network at a major airport*
  - *Evaluate Surveillance system performance with live ATC sensor traffic.*
  - *Evaluate Surveillance system performance with simulated & real Red Network traffic.*

Phased Research Project (cont)

--- 24 month period of performance ---

- ***Phase 4: Demonstration of a Wireless Sensor Network Enabled Distributed Surveillance and Operations System at a Major Airport***
  - ***Distributed sensors and displays implemented as a part of the CNS National Test Bed***
  - ***Test Bed will be made available to representative local users for evaluation***
  - ***Tasks Include:***
    - *Establishment of live data display to representative users for purpose of evaluating the system.*
    - *Planning & execution of an "Industry Day" to expose the test bed and wireless networking to other government agencies.*

Questions?