Prototyping Insights:

A Web Coverage Service Designed for a Consolidated NEXRAD and TDWR Service for NextGen Weather

August 3, 2011

Keith Bourke
Harris Corporation

Introduction

- The NextGen vision describes how new technologies including Web Services and Service Oriented Architecture (SOA) will help transform and integrate the Weather domain to provide benefits beyond the traditional NAS

As the volume of weather information continues to increase, the question:

> "**What** weather products are needed?"

Becomes

> "**How** should access to weather data be provided"?

The Harris Advanced Radar Processor (HARP) is designed to leverage technology to provide flexible access to the radar data users need, when they need it.

HARP Overview

- The objective of the HARP is to consolidate radar processing and provide near real-time radar products and services to weather consumers via an enterprise-wide SOA messaging environment

- The HARP uses two methods to share radar information
  - Web Coverage Service (WCS); request/reply
  - Routine mosaic products; publish/subscription
    - Mosaics products: Echo Top, Composite Reflectivity, Layer Composite Reflectivity, Latency
    - Coverage areas: CONUS, ARTCC, TRACON, Airport
    - Projections: PSN, Lambert Conformal, NAS Plane
    - Spatial Resolutions: 1 km, 2 km, 4 km and 8 km
    - Data level resolutions: 16 level, 8 level and DSR
    - Format: GeoTIFF, NetCDF4

*assured*communications®

HARP Overview (cont.)

- **The HARP is hosted in Harris' High Performance Weather and Climate (HPWC) architecture**

  – The HPWC is a NextGen Weather Processor (NWP) prototype designed to use a single external interface to a SWIM-like messaging system called the Data Exchange (DEX)

  – The DEX is an Enterprise-wide SOA messaging service that operates within the FAA Telecommunications Infrastructure (FTI) network
    - The DEX hosts weather registry/repository and catalog services
    - Rich amount of weather products are available via subscription

assuredcommunications®

HARP Routine Mosaic Products

- The HARP receives via HPWC subscription, live NEXRAD and TDWR high resolution level III base radar products
  - Product 94 is published to the DEX after receipt from NOAAPORT
  - The HARP maintains a virtual 3D CONUS representation of the radar information

- The HARP routinely creates and the HPWC publishes radar mosaic products
  - Similar to those available in today's NAS Weather systems
  - Use of product 94 (vs. volume products) improves latency

- Internal and external NAS Weather consumers can subscribe to the radar mosaic products they need via the DEX
  - Creates a virtual stream of radar mosaic information
  - Improved situational awareness

HARP Radar Web Coverage Service (WCS)

- **The HARP WCS is designed to respond to real-time requests for radar information**
  - The WCS front-end is an OGC standards-based interface
  - The WCS back-end is HARP-specific
  - The HARP WCS accesses the virtual 3D CONUS representation of radar information to respond to each request
  - The HARP WCS is scalable to support growth in demand

- **The WCS is designed to provide flexibility and users can specify the following parameters when making**
  - Coverage area: user-specified (3D volume in-work)
  - Product type: ET, Layer CR, CR
  - Resolution: (spatial and data level same as routine products)
  - Projection: (same as routine products)
 - Format (GeoTIFF, 3D NetCDF4 in-work)

assuredcommunications®

HARP Technical Description

- **HARP WCS**
  - OGC standards-based front-end interface
    - Supported request formats
      - HTTP GET
      - HTTP POST
      - SOAP
  - HARP-specific back-end WCS component
    - The WSC components use Java Message Service to communicate
  - FUSE release of Apache CFX, Servicemix and Active MQ
    - Open source preferred
  - Apache web server
    - Out-of-band delivery of radar information

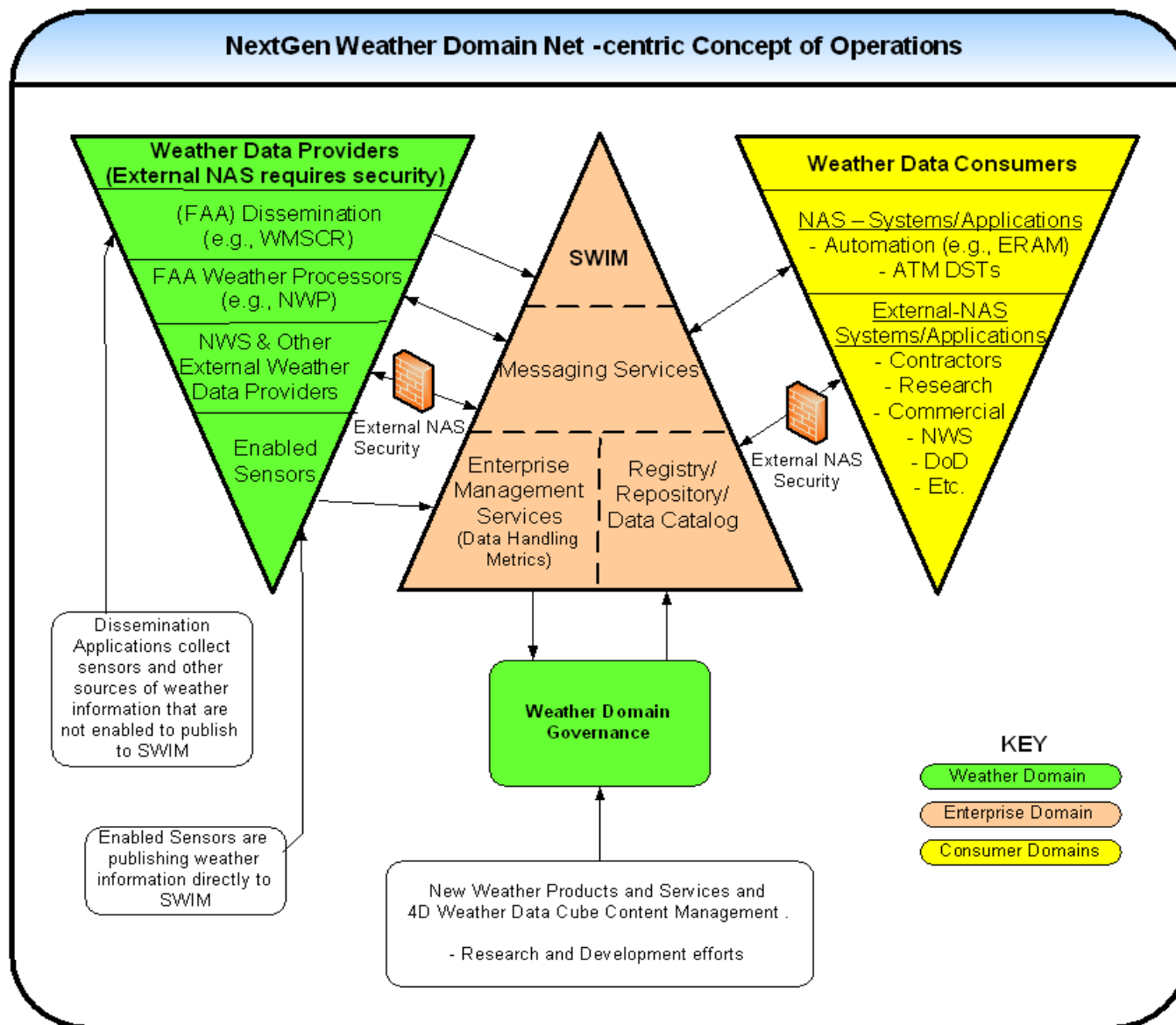- **HARP Routine Mosaic Product Generation**
  - Custom software
  - 64 bit Linux environment

HARP in the Research Lab

HARRIS
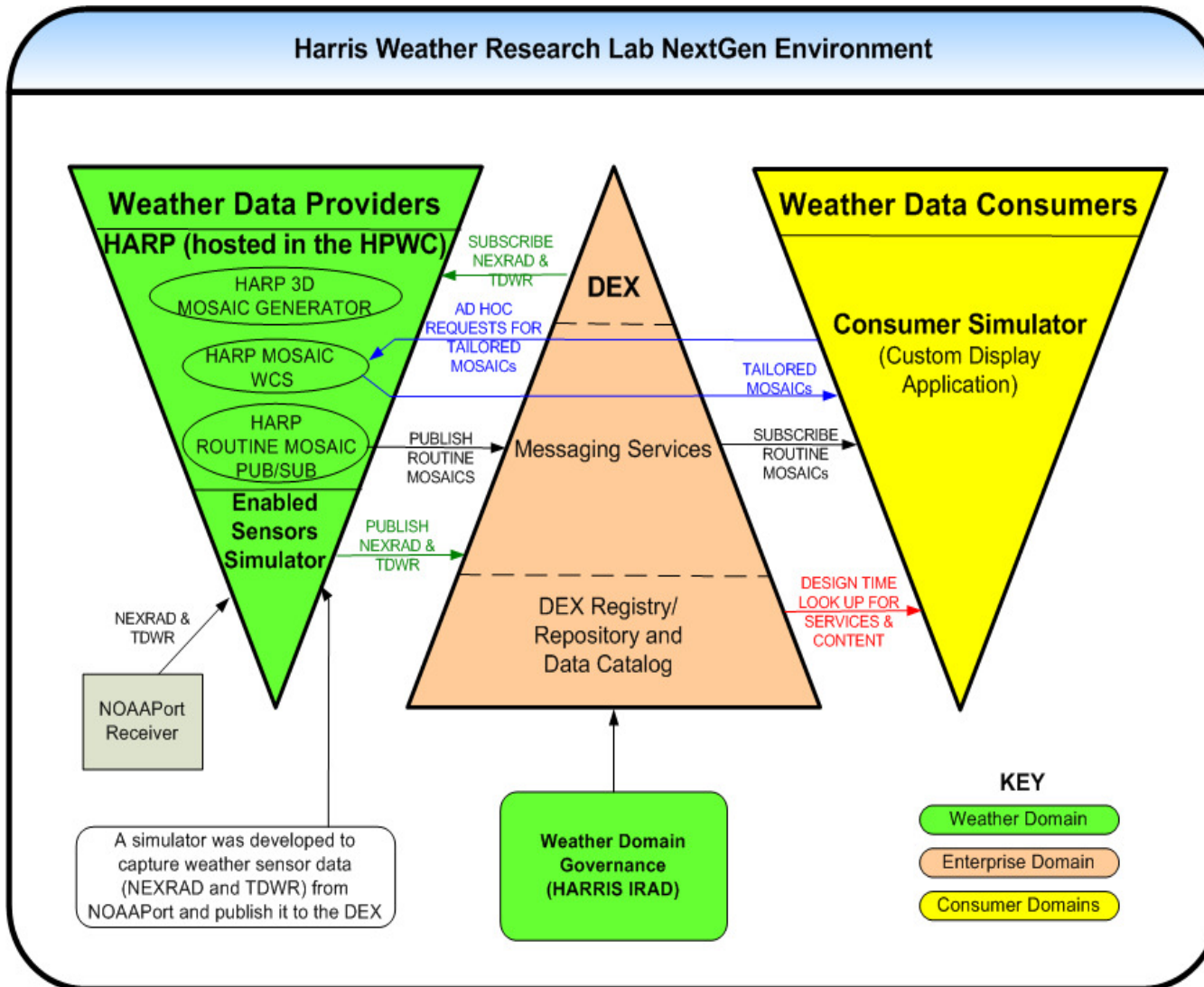
- **The HARP is integrated into the HPWC**
  - NWP prototype

- **All Data Exchange occurs through the DEX**

- **Weather Consumer is a notional Luciad-based display user**

HARP Usage in NextGen

HARRIS

NextGen Weather Domain Net -centric Concept of Operations

- The HARP is integrated into the NWP

- All Data Exchange occurs through SWIM
  - NEXRAD and TDWR are enabled sensors
  - Secure Gateways for external-NAS exchanges

- Broad range of Internal and external NAS Wx consumers have access to HARP products and services

- Depicts Notional role of Wx Governance

HARP Future Plans

- Addition of Canadian Weather radar

- Comprehensive 3D NetCDF4 WCS support

- HARP to DSR/ERAM mosaic exchange via DEX

- ½ km resolution support

- Partners?

Summary

- A consolidated, net-centric HARP capability has potential to support a broad range of weather users internal and external to the NAS that includes:
  - Traditional image-based users of radar information (includes controllers)
  - Analytical capabilities for meteorologists
  - Automated Decision Support Tools (DSTs)
  - Development efforts
  - Research efforts
  - Flight operations

> The HARP is a radar-centric example of a NextGen capability that can help simplify an ever-growing and complex data environment and deliver the information weather consumers need, when they need it.

Acknowledgement

- Harris Corporation and Unisys have collaborated in the development of the HARP application since March, 2010

assured communications®