

Discussion Outline

- Intergraph's Roles
- Guiding Principles
- Where are We Now?
- What is Available?
- Gaps
- What is the Plan?
- Future Work
- Proposed Schedule

Intergraph's Roles

- Put Sensor Data on the Display!
- Prime Contractor to ORNL for BEST
- Cooperation in Sensor Web Enablement
- Implement a 'Practical' SensorNet employing the principles of SWE and OGC into a real world commercial system.
- Participate in Standard's Process including OGC, OWS-3, OASIS, ComCare and others.

Guiding Principles For Near Term

- Consider BEST the Reference Implementation.
- Focus on implementing the ready set of standards that are mature and proven.
- Develop 'New Standards' inside the existing framework or congruent with that framework.
- To ensure interoperability in near term, develop the 'certifying interface' for conformance against the Reference.
- Establish a Cert Process, include various levels of sophistication.
- Publicize and Propose New Standards.

- Concepts borrowed from DARPA and Markle Foundation

History Lesson!

Current Generation Civilian Command and Control

- Very little web services.
- RDBMS based Resources Modeled in Database.
- No Method of 'Discovery'.
- TCP/IP, Serial or Other Connections.
- Standards Generated by Telcom, FCC, NFPA, UL and Insurance Industry.
- 'Old Standards' adversely impact where we need to go.
 - NFPA/UL Network Limitations.

Next Generation Command and Control at Intergraph

- Standard's Based Efforts Started ~ 2000. Based on Need to Share Critical Public Safety Data and Integration in the National Capital Region.
- 'Simple' Web Services Started 2002
- Integrated Interdependent Web Services Concept Started Early 2003.
- Auto Discovery Started Late 2003
- Examples
 - Security Systems (Hovawart)
 - Video Systems (ICBM/NDW)
 - Emergency Medical Systems (UAB)



Radio Data

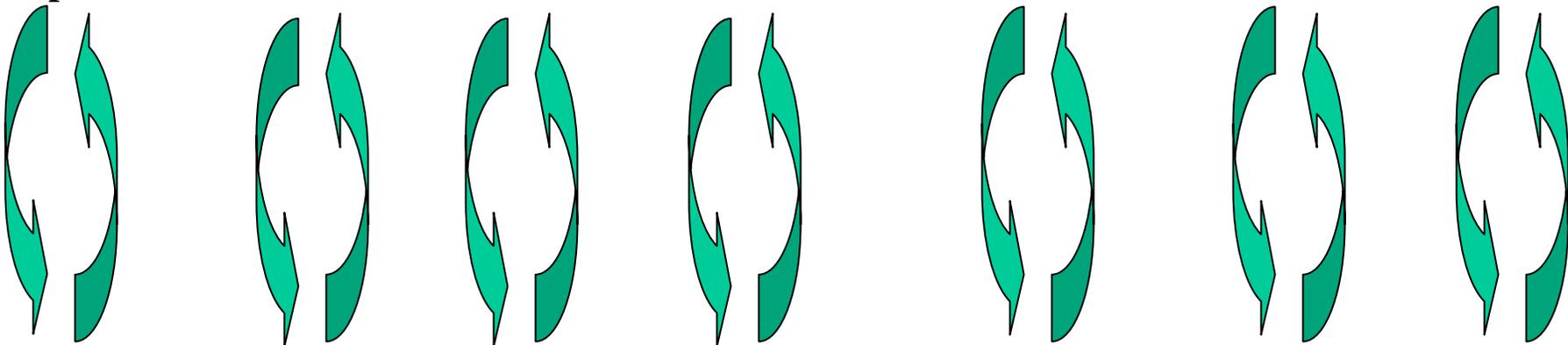
**GIS/Mapping
Data Personnel and
Unit Data**

Video Data

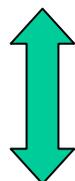
**Sensor
Data**

Record

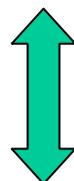
Telephone Data



Decision Support Multi Display



Audio



KB/Mouse



Operator



I/Dispatcher

Location: 29 RUGBY ST, MT COOK, WELLINGTON CITY

Event Type: ENQUIRY/INVESTIGATION

Name: ABBOTT, COLIN Address: PORIRUA POLICE STATION

Mode: Create, Update, Select, Hot Call

Orig Terminal: 48408928

16:47 21/12/2000 DD080930

Field S.O.P. Msg Overlay SMACS Display Fax Scratch Alarms Merge Ev Strch Suprvsr Off Radios

Unit Alarm Update Message

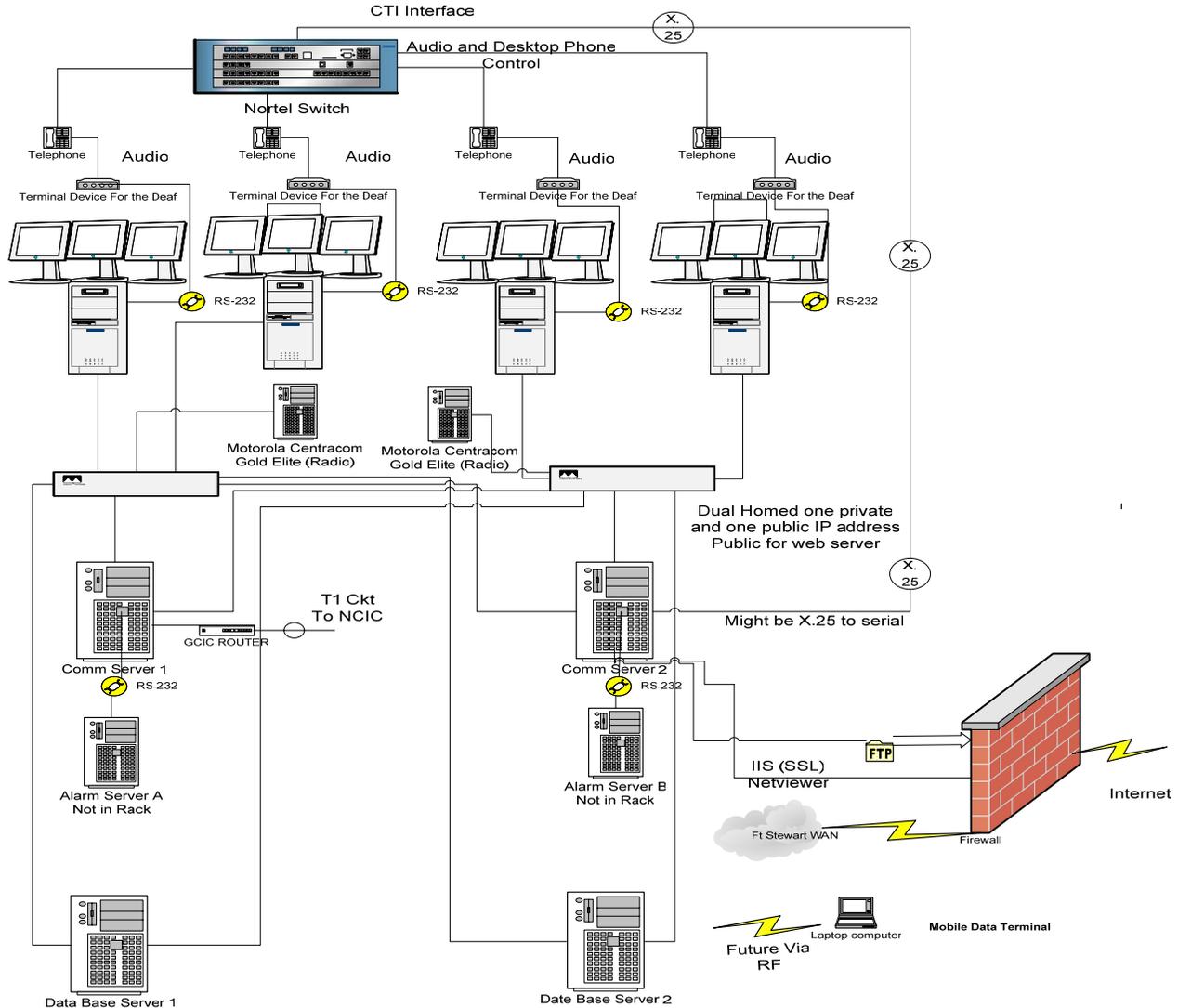
Channel List: Taranaki Floral M, New Plymouth 1, New Plymouth 2 F, Wanganui 1 MP, Palmerston North

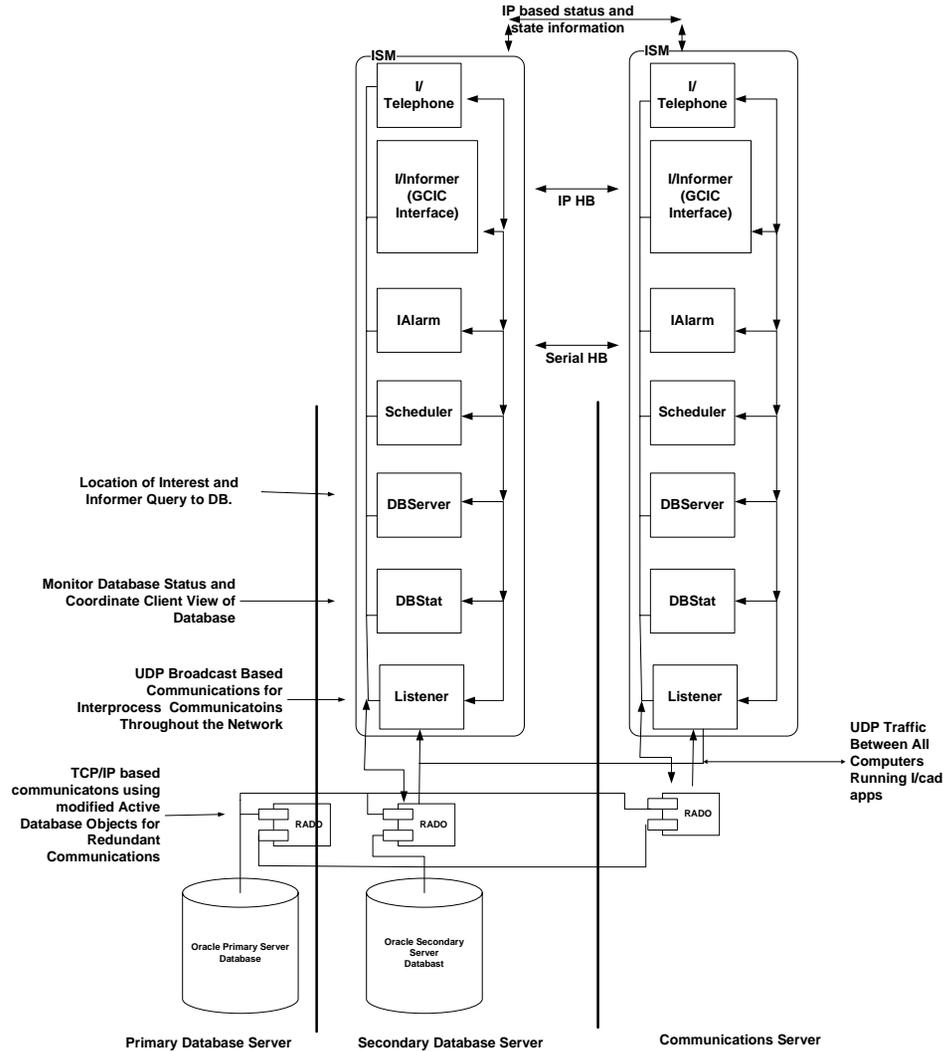
Map: Increasing traffic at 16:47:17 on Taranaki Road MP

Unit Status Monitor

Unit	SMACS	Exp	A	Disrupt	St	Time	Event Number	Event	DS	Location
A02	L	020X	AR	1		0001324142	42	PA PLUNKET ROOMS MUNGAMUN AV.		
B003						2100	AV	1		NG NGAMUTU RD-SPOTSWOOD NEW PLY
BSR1						R170X	AV	202		PA PORTABLE
BVD						1600	OS	40	100	NR STA 1600
C10						1600	OS	34	100	HK STA 1600
CFR2						R200C	ER	6	0001323963	104M WA WOODLANDS RD-CARTERTON EAST C
DV12						11800	AV	180		PA 3 GORDON ST-DANNEVIKKE URBAN LT
DV51						52300	AV	30		PA DANNEVIKKE
P124						52300	AV	30		PA FOXTON
P15						52300	AV	30		PA FOXTON
SS12						2300	AR	109	0001324010	4P G2 ABERDEEN RD-AVTON RD-TE HAPU
SS22						16541	OS	742	0001324112	1C G2 MICHAEL GDS 2410204
SS22						R 2300	ER	4	0001324112	1C G2 WANHAU RD-TOLAGA BAY RURAL GISE
SS22						DF	89			2 ANZIC ST GIBBORNE CENTRAL GISE
SS22						2300	AV	5		G2 RET WITH ONE
SS22						0100	AV	52		G2 BRIGHT ST GIBBORNE CENTRAL GISE
SS22						0100	AV	52		G2 BALLANCE ST, RAILWAY LA WHATAUF
SS22						0100	AV	67		G2 GIBBORNE CENTRAL
SS22						0100	AV	67		G2 GIBBORNE CENTRAL
SS22						0100	AV	67		G2 GIBBORNE CENTRAL
SS22						0100	AV	67		G2 GIBBORNE CENTRAL
SS22						0100	AV	43		G2 GIBBORNE CENTRAL
SS22						1700	AV	490		G2 GIBBORNE CENTRAL
SS22						DF	254	0001321905	8H	2 PATITI ST MANGAPARA GIBBORNE D

Ready | Select Event | I/Dispatcher | Locate/Verify | RCT | Channel List | Screen Dumb: Paint | 16:47:18





Near Term Design Philosophy

- “Front End to the External World” Employs Multiple , Potentially Interdependent Web Services.
- Web Services Are Standards Based or We Develop in a Framework That Could Be a Extension of Or Proposed New Standard.
- Inter-process Communication, Internal to the COTS System Remains Dedicated, Channelized Communications.
- Near Term ... Best of Both Worlds
 - New Interfaces Can Take Advantage of Modern Languages and Web Service Technology, While Internal Processes Remain at 99.99x% Reliability and Rapid Ubiquitous Transport Across the Local Net.



What Do We Need For SensorNet Into I2MC?

- Discovery
 - Who is out there and what can they tell us?
- Monitoring
 - What is the measurement of this parameter now and for some period of time?
- Alerting
 - Alarms or Important Status
- Tasking
 - Change the Alarm Threshold to a New Level

Standards Status

- The entire standards based solution does not exist, but there are sufficient mature standards and tools to build the framework in a standards based environment.
- Next several slides will look at some options and outline Intergraph's concept.

What Suitable Standards Exist

- OGC WFS
 - Simple standards based method to discover sensors and capabilities.
- WS-N
 - Could be used to subscribe for events. Has most needed functions.
- OASIS SOAP et al
 - Framework for Message including security
- OASIS CAP and EDXL
 - May provide more focused capabilities

GAPS

- In Very Large Scale Systems How To Discover All of the Services?
 - Catalog Concept? Multiple WFS, WS-N, SAS, SOS and others.
- Monitoring in Real Time
 - SOS not fully defined, too thick
 - Practical Limits on WFS Archiving
 - Multiple, Frequent Sensor Parameter Readings
 - ‘SCADA Like’
 - OPC? RSS?

GAPS

- Sensor Control
- Change thresholds, sample rates, measurement parameters, reporting....
- SPS Not Fully Defined.
 - Sensor ML tells us about, but not how to control today.
 - Extension of Sensor ML for dictionary?
 - Command Predicate? What if it fails?
 - How do we adjudicate control conflicts?
 - Sensor vs. Platform issues.

GAPS

- SOAP/XML bandwidth impact
- In 'real' systems the assumption of nearly infinite bandwidth causes enormous problems.
 - Binary XML?
 - Standard Compression? (90% or better)
 - Translators?

What is the Plan?

- COTS I/CAD software Integration
- Web Feature Service
 - First Priority
- Subscription Framework
 - Existing Standard to Start (WS-N?)
- Alerting Service
 - Existing standard to Start with Simple Messages
- Observation Service
 - May need near term simple streaming model.

COTS Integration Status

- ‘Plumbing Framework Nearly Complete’
 - Map and Monitor Code Created to Interface Clients with Web Service Capable Applications on I2MC Servers
 - Generic ‘Monitor’ Created Inside Existing System
 - Allows text based interaction with Sensors
 - Mapping System Interfaced With ‘Objects’ to Draw/Modify Real Time Graphics.
 - Communication Framework Exists Between Clients and Servers
 - Ability to ‘Command Messages’ From Pull Down Menus Nearly Complete

WFS Issues

- WFS Framework Geo-Spatial Query Power
- Details Remain, But WFS Concept Will Be Used.
 - Oracle with Intergraph? Other off the shelf?
 - Near Term -- Could Use For Measurements (Not Viable Long Term)
 - Extensions To Existing Dictionary Required?



Beyond Discovery and Simple Data

- Publish Subscribe Framework for Alerts
- WS-N? As the Generic Framework?
 - Publish and Subscribe to Alerts and Measurements (WSN/CAP/Other).
 - Good Enough For Alerts Today.
 - With constructs might function as observation service.
 - OASIS Protocols Could Handle Concerns Such as Tokens, Encryption, Authentication

OASIS

Web Services Base Notification 1.2 (WS-BaseNotification)

Working Draft 03, 21 June 2004

Document identifier

wsn-WS-BaseNotification-1.2-draft-03

Location:

<http://docs.oasis-open.org/wsn/2004/06/wsn-WS-BaseNotification-1.2-draft-03.pdf>

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Abstract:

The Event-driven, or Notification-based, interaction pattern is a commonly used pattern for inter-object communications. Examples exist in many domains, for example in publish/subscribe systems provided by Message Oriented Middleware vendors, or in system and device management domains. This notification pattern is increasingly being used in a Web services context.

OASIS WS-N Standard TOC

NotificationConsumer Interface

3.1 [Notify](#)

3.1.1 Example SOAP Encoding of the Notify Message

4 [NotificationProducer Interface](#)

4.1 NotificationProducer Resource Properties

4.2 [Subscribe](#)

4.2.1 Example SOAP Encoding of the Subscribe Message Exchange

OASIS WS-N Standard TOC

This Group Could Obtain Immediate Sensor Readings

4.3 GetCurrentMessage

4.3.1 Example SOAP Encoding of the GetCurrentMessage Message Exchange

5 SubscriptionManager Interface

5.1 Subscription Resource Properties

This Group Could Start and Stop Readings

5.2 PauseSubscription

5.2.1 Example SOAP Encoding of the PauseSubscription Message Exchange

5.3 ResumeSubscription

5.3.1 Example SOAP Encoding of the ResumeSubscription Message Exchange

SensorNet Integration Results

- Alerts Will Be Displayed on Maps and 'Monitors'.
- Text Based Readings Can Be Displayed In Real Time on Monitors, On Demand on Maps.
- Geospatial Queries Will Be Achievable
- 'Plumbing in Place' To Send Commands to Sensors.
- Standards Based Framework in Place For Large Scale Capabilities Growth



Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
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Build
Bragg
CAD

Onsite
Integrate
Lab??

Integrate
Fire
Alarms

Integrate
CBRN
Sensors

CAD
Install

1
Replace
I/ALARM

2
OGC Framework,
WFS Client

3
SAS
Adapter

4
SPS, SOS
Adapters

Existing CAD Contract

Existing Sensornet Contract

Contract Mod (extension + CBRN? + Other?)

Future Work

- Multiple Catalog Problem.
- Synchronous Processes.
- 'Real Time' Demands.
- Guarantee of Delivery.
- Life Safety Reliability.
- Sensor Data Fusion.



What Are We Going to Accomplish

- Sensor Data and Alerts will be on the displays.
- The 'plumbing' will be in place for extensibility to new web services.
- The external framework will be standards based.
- There will be exceptions, but we will document them!