



Employing Net Centric Technology for a Mobile Weather Intelligence Capability

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Battlefield Environment Division

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BACKGROUND

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The environment can adversely affect weapon systems and military operations at all echelons. A priori and near real-time knowledge of these effects (both over time and space) can assist the Commander and Soldier in both the planning and execution phases of missions.

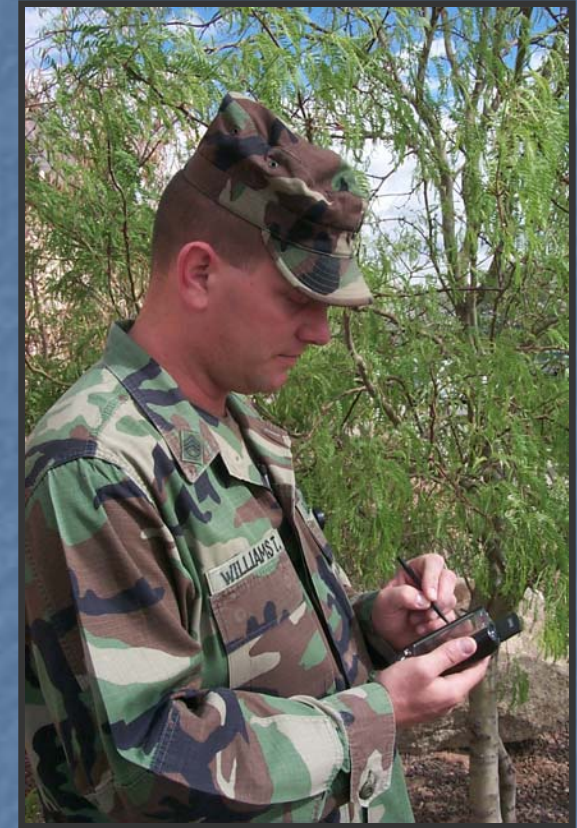


OBJECTIVE

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Develop weather related Actionable Intelligence (e.g., decision aids, alerts, situational awareness, etc) to enable rapid visualization and understanding of critical information. Provide this Intelligence via net centric means on a mobile device to empower lower echelon users.*



*Examples of net centric technologies include distributed computing (e.g., web services and Java remote method invocation), wireless and mobile computing, network protocols and shared dataspace



APPROACH

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- **Continually leverage rapid advances in hardware technology to host applications on a highly portable mobile computing device**
 - **Develop applications using emerging & existing software standards (e.g., Web services, XML, Java) for portability and rapid transition of the technology to the Warfighter**
 - **Develop standalone applications for the mobile device where possible to eliminate requirement for a remote server**



PROTOTYPE MOBILE PLATFORM



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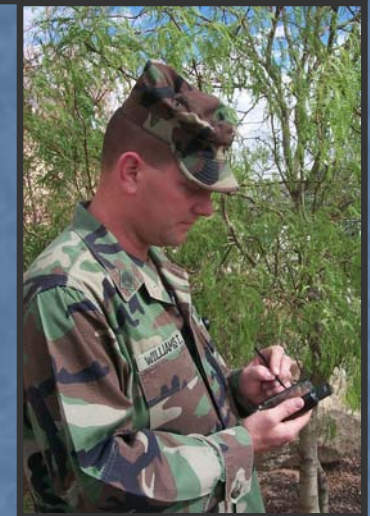
Toshiba e800 personal digital assistant (PDA)



- 5.3" x 3.0" x 0.6"
- Color display
- 128 MB SDRAM



- 6.8 ounces
- 400 MHz processor
- 240x320/480x640 resolution
- Embedded microphone/speaker
- Integrated Wi-Fi (802.11b)
- Integrated secure digital slot
- Integrated Compact Flash slot





SOFTWARE ENVIRONMENT

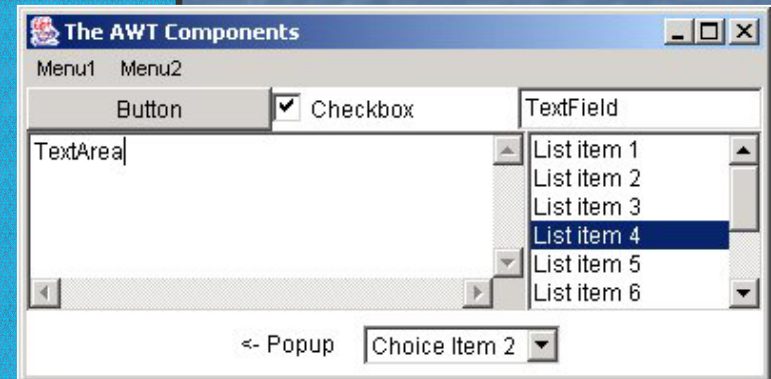


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Java for most application coding

- Fairly robust programming and graphical user interface capabilities
- Very portable code (tested under Win2000, PocketPC OS and Solaris Unix with no recompilation)
- Small footprint binaries (10's of Kb)



Java remote method invocation for client/server

- Allows PDA to make remote queries to a relational database server over wireless comms (802.11)



Relational database software on secure digital card

- Applications can query local DB if wireless comms unavailable



INTEGRATED WEATHER EFFECTS DECISION AID (IWEDA)



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System	22/12	22/15	22/18	22/21	23/0
M109 SP HOWITZER	E	G	G	G	A
ARTILLERY	E	E	G	G	E
NIGHT VISION SIGHT TAS-5	E	G	G	G	E
ARMOR GUN SIGHTING	*	G	G	G	E

- Provides critical environmental effects information
- Inventory of 300+ weapon systems and operations (numerous foreign)
- Color coded impacts
- Static map overlay capability
- Remote and local server versions
- Matrix cell tap retrieves the basic weather impacts:

Condensed Impacts

System name: ARMOR GUN SIGHTING

Forecast period: 22/12

System ARMOR GUN SIGHTING has marginal impact: *Low Visibility*



WEATHER ALERT SUBSCRIPTION



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Alert Subscription Server

Tap "QUERY NOW" to read client subscriptions and query weather effects DB for pending alerts.

Set "QUERY FREQUENCY" to query DB at a set interval (values < 10 will be set to 10).

QUERY FREQUENCY: minutes

of Clients Subscribed:

SERVER

Weather Alert!

SERVICE STARTED!

You may now subscribe to alerts...

(UN)SUBSCRIBE:

NOTIFY MODE:

CLIENT

- Two alert modes (visual/visual&audible)
- Several alert subscription choices
- Integrated w/GPS capability to automatically set geographic location (spatially dependent alerts database)
- Requires wireless comms back to a remote server



MOBILE HEAT STRESS



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MobileHeatStress

INPUTS:

Location: 32.37 N, 106.4 W

Month: Feb, Day: 7

Local Time (hhmm): 1031

Weather: Clear

Wind: Calm, Humidity: Dry

Temperature: 50 deg F

Workrate: Moderate

Clothing: MOPP 1/2

COMPUTE **EXIT**

Prob of heat stress injury = 18%

Work/rest cycle = 60 minutes

Max work time = 300 minutes

Canteens water (per hour) = 0.8

WBGT (Deg Fahrenheit) = 47

- Provides critical heat stress parameters based solely on local input of data
- Underlying physics based algorithms from USARIEM
- Current date/time and location are automatically set using Java utilities and GPS output (if available)
- Java GUI; USARIEM algorithms and insolation calculation in a C dll accessed via Java Native Interface
- Input is error trapped for valid entries



SPOT WEATHER REPORT



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Local Observation Broadca... [min] [max] [close]

Location: 36.734 N 68.922 E

Date/Time: 24 May 1027 GMT

temperature: 67 F

cloud amount: 8 8ths

cloud height: 500 feet

wind dir: 315 deg

wind speed: 16 kts

visibility: a km

Status: Invalid visibility, retry

Clear All Entries SEND EXIT

- Allows entry and transmission of local weather observation to remote server
- Potential uses: initialization of a prognostic or diagnostic high resolution weather model; in a CBR diffusion model; etc.
- Current date/time and location are automatically set using Java utilities and GPS output
- As with other mobile apps, input is error trapped for valid inputs





PROTOTYPE APPLICATIONS



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Mobile Acoustic Propagation Decision Aid:

Provides probability of detection of an acoustic source given a sensor and the range & azimuth between them

High Resolution Objective Analysis:

- Real time 2-D objective analysis of sparse meteorological observations (e.g., wind speed, temperature, etc)
- Provides a regularly spaced high resolution analysis field
- Output potentially can be used as input for various other applications at locations where direct measurements are not available

The screenshot shows the MobileABFA application window. It contains the following elements:

- SOURCE:** Apache (dropdown menu)
- Height AGL:** 250 (text input) meters (dropdown menu)
- SENSOR:** Human (dropdown menu)
- Height AGL:** 2 (text input) meters (dropdown menu)
- Azimuth to source:** 315 (text input) degrees (dropdown menu)
- Range to source:** 400 (text input) meter (dropdown menu)
- Message:** CALL SUCCESSFULL!
Enter new inputs to reCOMPUTE.
- PROB OF DETECTION:** 17% (text display)
- Buttons:** COMPUTE and EXIT



LEGACY APPLICATIONS



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Two Pascal applications running under DOS emulator:

- **3D Chemical Hazard** – Provides prediction of the horizontal and vertical extents of chemical vapor hazard to low flying aviators
- **Night Vision Goggles** – Provides guidance (text and graphics) on favorable times of NVG use as a function of predicted ambient illumination.



FUTURE EFFORTS

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- High resolution 3-D meteorological analysis capability
- Interactive mapping capability
- Collaborative software agents
- Investigation of JavaSpaces* technology for implementation of distributed applications and data
- Additional decision aids/applications
- Partner with an ongoing program or participate in an exercise/demonstration to evaluate utility of products

*A JavaSpace is a network accessible, shared memory repository for reading, taking and writing of objects via loosely coupled processes