

# Radiology Protocol Tool Recorder (RAPTOR)

*Open Source Radiology Dashboard Improves  
Clinical Workflow & Protocol Decision Support*

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# Disclosures

- Summarizes work performed under a Veterans Administration Innovation Initiative Award
- SAN Business Consultants LLP, a woman-owned small disadvantaged business 8(a), was awarded the RAPTOR design and development contract
- None of the information is meant to endorse private sector activities, obligate the Federal Government to follow any particular course of action, nor to espouse an official position of the Federal Government, for the present or in the future

# Advanced Medical Imaging Protocol Workflow (CT, MR, NM)



- Protocol = Image exam acquisition instructions
  - MD assigned (i.e. a medical decision)
  - Pre-procedure, Intra-procedure & Post-procedure components
- Impact Opportunities

# Protocol Assignment Workflow – Why RAPTOR is Needed



## • Functional Reasons

- Typically paper-based
- Insufficient info for optimized decisions
- Vague documentation of responsibility
- Protocols workflow importance undervalued
- Productivity – Quality – Safety – Compliance

## • Technical Reasons

- VistA (EMR) modernization
  - Dated technology, needlessly complex
  - Integration of new technology/ideas difficult
  - Development takes too long to deliver
  - Maintenance, installation and operations are difficult

# Protocol Assignment Workflow – INNOVATION



## Functional Innovation

- Leverage VA information systems
  - Optimized web-based tool
  - Information Dashboard
- Right Information, Right Time
- Decision Support
  - Configurable business rules
  - Optimize Quality & Safety
- Extensible
- Foundation for Accessibility, Versatility & Scalability

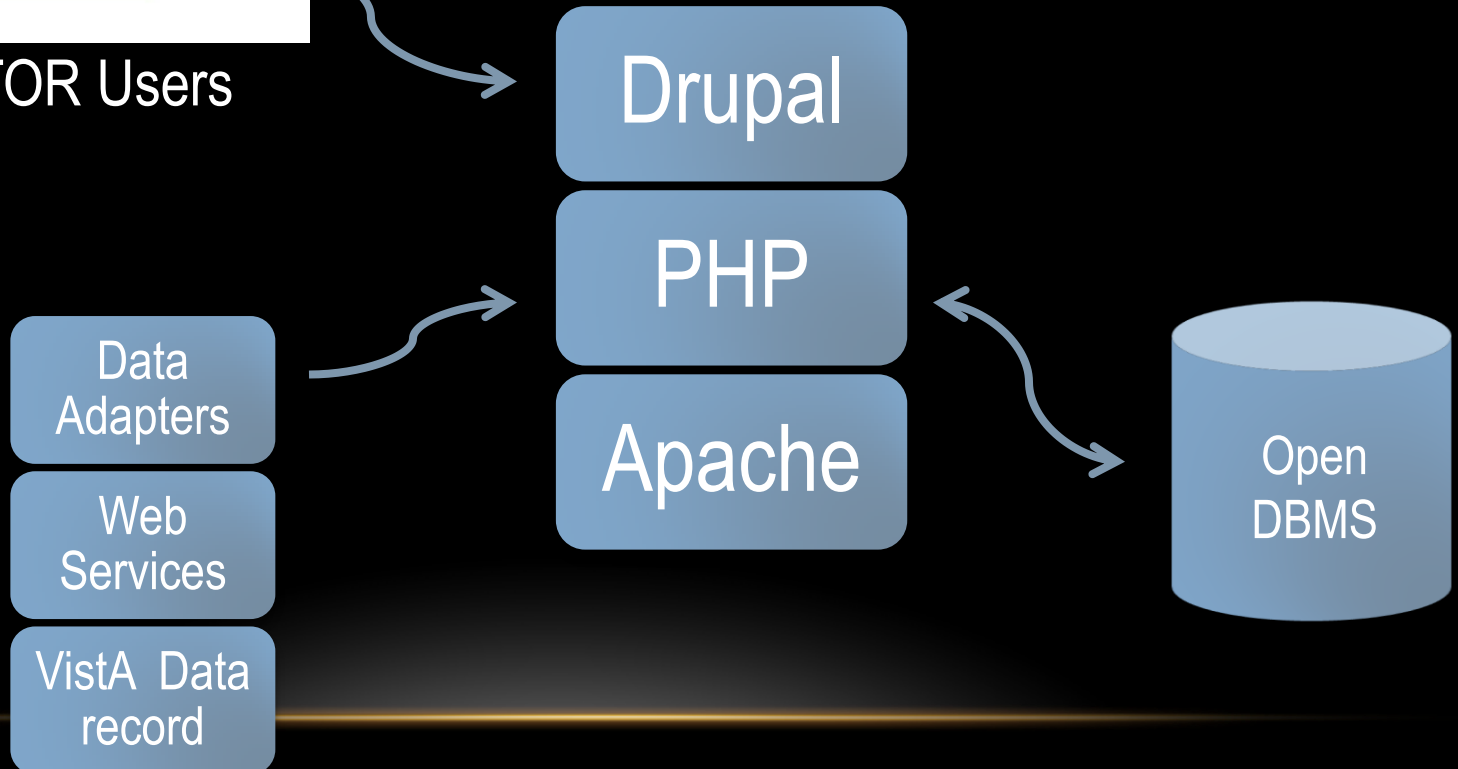
## Technical Innovation

- Open source tools
  - Drupal, PHP, Linux, Apache, MySQL...more
- Reuse web services components
  - Medical Domain Web Services (MDWS)
- Agile development process
  - On time, on budget
- Sandbox virtual environment mirrored clinical workstation
  - Design, Development, Demo's

# RAPTOR – Open Architecture



RAPTOR Users



# RAPTOR – Screen Shot



Patient Header

**RAPTOR** Not an enabled user of RAPTOR!  
Logged in as NON-AUTH-USER

<b>Id:</b> 129	<b>Name:</b> ZZZRETIREDSEVENTYSEVEN,PATIENT	<b>Age:</b> 78	<b>DOB:</b> 04/07/1935	<b>Ethnicity:</b> ASIAN OR PACIFIC ISLANDER	<b>Gender:</b> M
<b>Loc:</b> Room: / Bed:	<b>Transp:</b> INPATIENT				
<b>Study:</b> CT ABDOMEN W/O CONT	<b>Img Type:</b> GENERAL RADIOLOGY	<b>Urgency:</b> ROUTINE	<b>Due:</b> APR 05, 1995	<b>Created:</b> APR 05, 1995@11:59:38	<b>Mode:</b> VIEW

Drill-down Information Tabs

- protocol
- medications
- vitals
- allergies
- labs
- rad exp
- clin rpts
- notes
- rad rpts
- rad notebook

Configurable Alerts

1. Other studies for same patient
2. Diagnostic exam contraindicated due to the use of Metformin

Protocol Action Space

**PROTOCOL NAME**  
- Select -  
A standard protocol from the hospital's radiology notebook.

**2ND PROTOCOL NAME**  
Select a second protocol only if more than one is needed for this study.

**HYDRATION**

None

Oral

IV

**CONTRAST**

None

Enteric

IV

Information Dashboard

**Order Overview**

Requested By:	WARDCLERK,FIFTYTHREE
Reason For Study:	Not entered
Requested Study:	CT ABDOMEN W/O CONT
PCP:	Unknown
Attending:	Unknown
Clinical Hx:	No Clinical Hx Found.

**Medications**

Med	At Risk ?	Status
Metformin	Y	
Coumadin		

(...more)

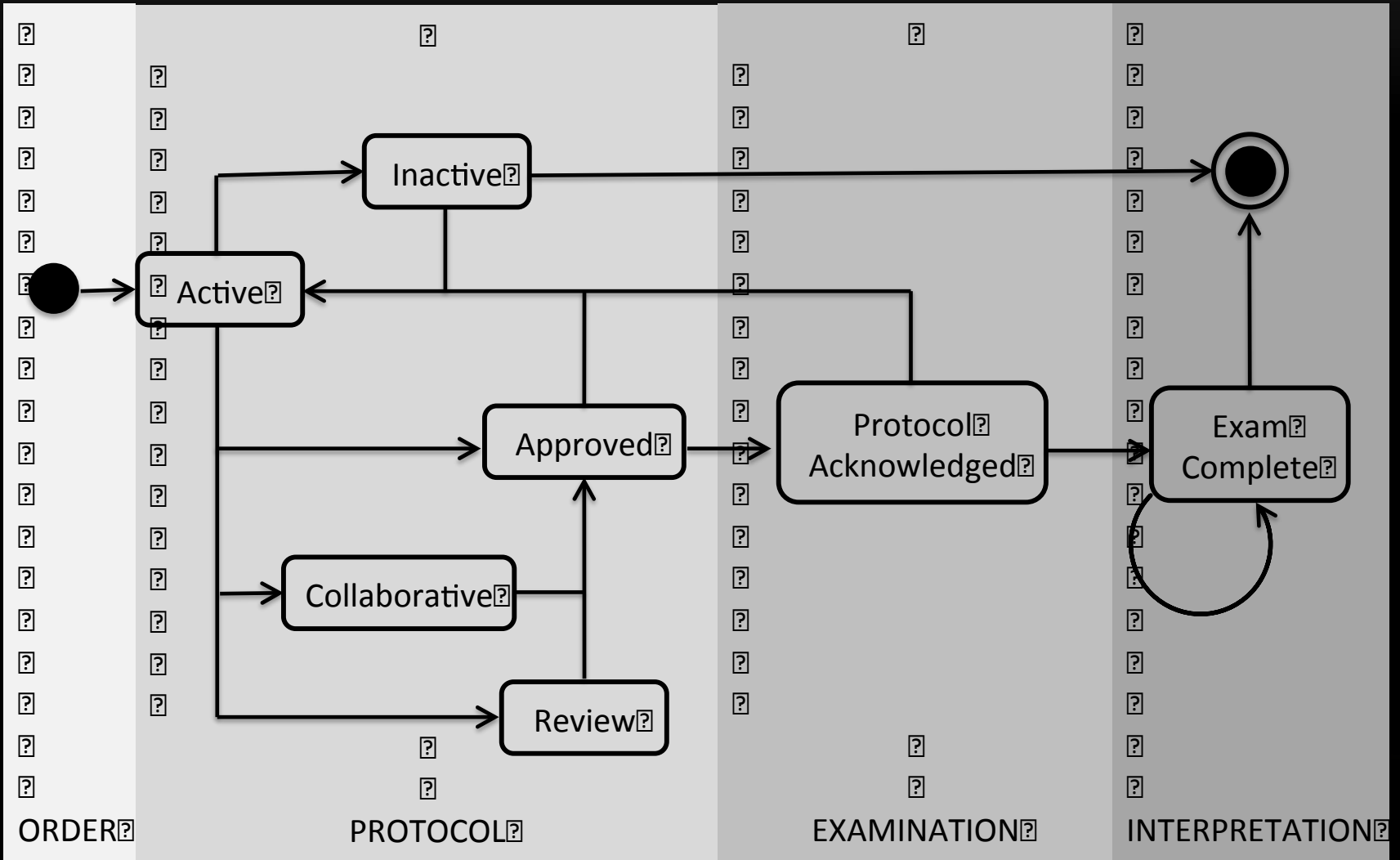
**Vitals**

Date	Vital	Value
04/09/2003 08:42 am	Blood Pressure	170/72 mmHg
04/09/2003 08:42 am	Temperature	98.6 F
10/05/1998 02:24 pm	Body Mass Index	36*
10/05/1998 02:24 pm	Weight	220 lb (99.8 kgs)
10/22/1997 10:34 am	Height	66 in (167.6 cms)
	HEART RATE	None Found

**Blood Pressure**

(...more)

# RAPTOR – State Diagram





# Results –

## Comparison Before vs With RAPTOR



Attribute	Before RAPTOR	With RAPTOR
• Environment	• Paper	• Web-based; Paperless
• Level of Interoperability	• Lowest – paper or scanned paper	• Highest – Computational electronic data
• Patient Identifiable Information	• Poor (if any) security control	• Role-based authentication
• Collaboration, communication	• Handwritten, Fax or phone	• Automated into workflow
• Work distribution	• Stacks of paper manually distributed	• Entire process is automated with priorities set by configurable rules
• Records Management	• Shred or scanned	• Entire process is recorded for management review and reporting



*Thank you*

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