



Open Source A Strategic Tool for Improving Global Health Care

Geneva, December 2003

Joseph Dal Molin

Open Source Health Care Alliance

OSHCA

Traditional Software Development Models Have Not Been Effective in Health Care

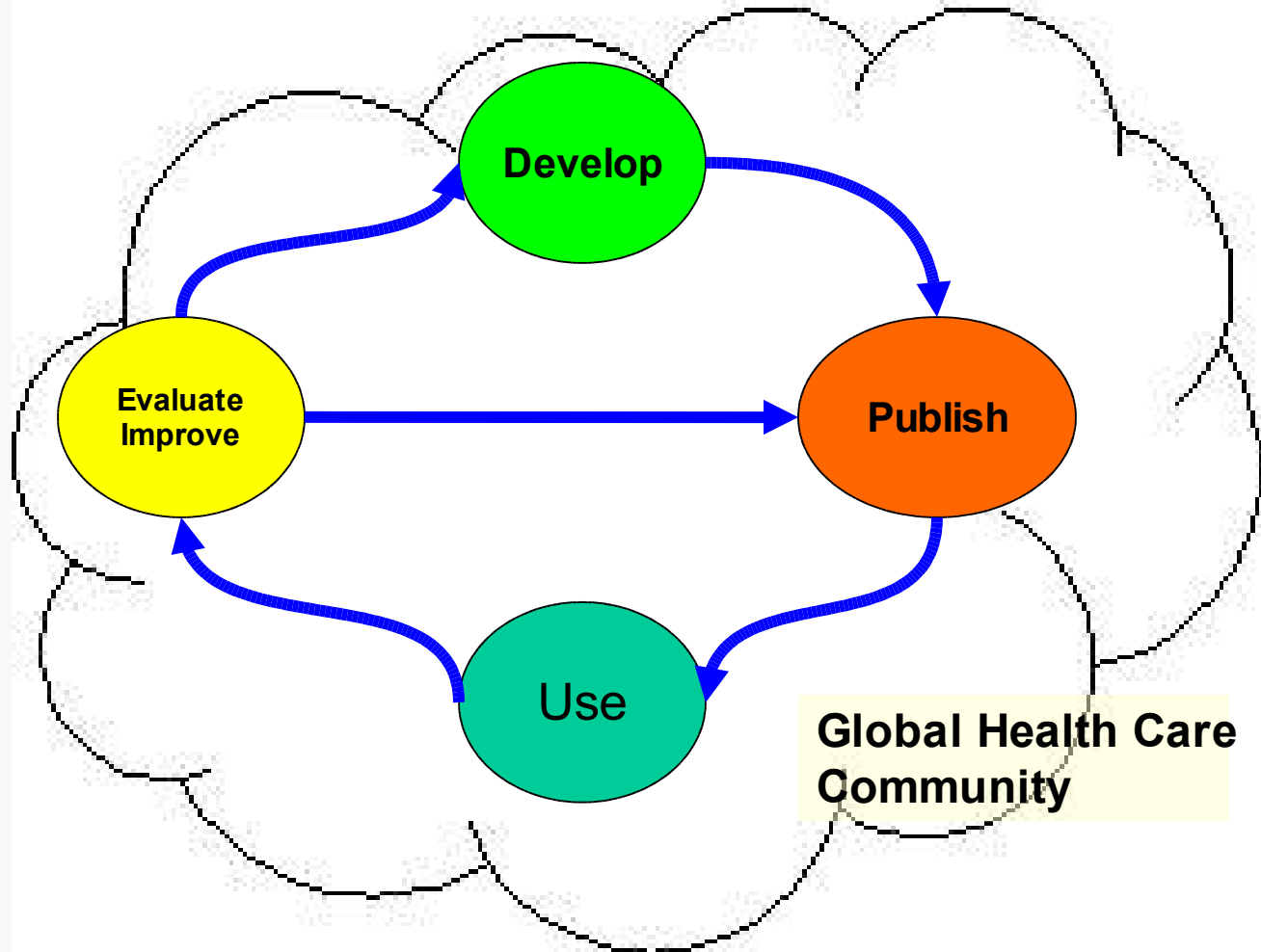
- Medical software is too expensive
- It is difficult to share medical information
- It is difficult to measure effectiveness of health policies and investments in information technology
- Much re-inventing of the wheel even though the basic requirements health care are essentially the same everywhere

It Is Time for a New Paradigm

"The significant problems we face cannot be solved at the same level of thinking we were at when we created them."

Albert Einstein

The Open Source Cycle



What is OpenSource / Software Libre

- Software source code is freely available
- Any party can sell or give away copies
- Derived works can or must be distributed under same terms
- Anyone can participate
- Can establish a virtuous spiral of improvement

“evidence driven software evolution”

OSHCA: The Open Source Healthcare Alliance

- Established in November 1999
- 100+ members
- In process of incorporating as a not for profit (NGO)

Meetings and Sponsors

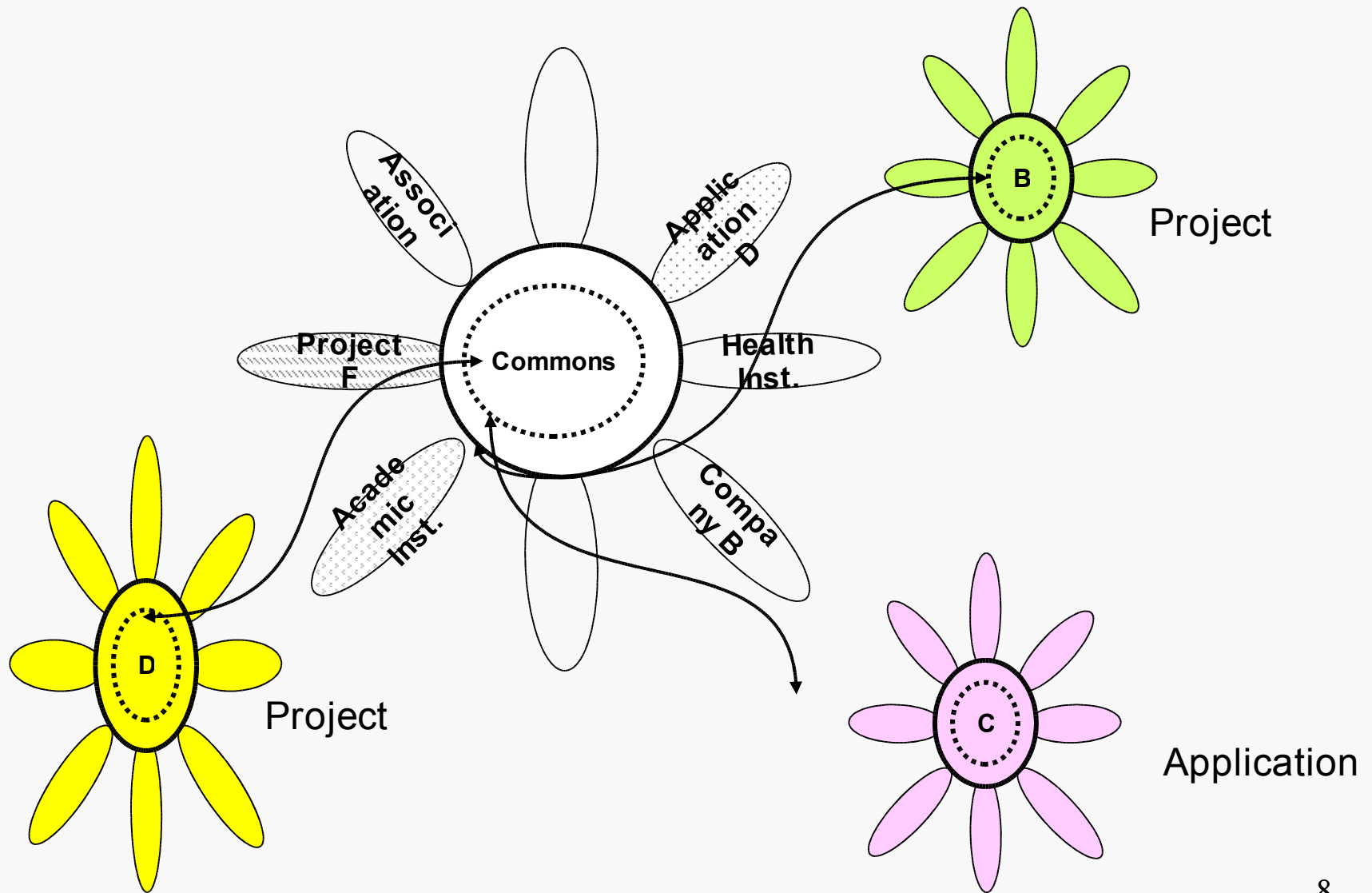
- June 2000, Rome, Inaugural meeting Rome, FAO
- Sept 2001, London, UK National Health Service IA
- Nov. 2002, Los Angeles, UCLA
- Dec 2003, Geneva, University Hospital of Geneva

Why was OSHCA created?

Priming the Virtuous Spiral

- Create a core group of collaborators
- Identify “seed” project(s)
- Gather together a “global” community
- Provide meeting place and “workshop”
- Build just enough
- Get out of the way

An evolving ecosystem of communities



Mature Open Source Systems for Health Care Exist Today - Some Examples

- openVistA
 - WorldVistA, www.worldvista.org
- OSCAR
 - McMaster University Department of Family Medicine,
- TORCH
 - Open Paradigm, www.openparadigms.com

openVistA

A complete, fully integrated hospital information system
based on the U.S. Veteran's Hospital VistA system

openVISTA

The screenshot displays the openVISTA medical software interface. At the top, there are two windows: "VISTA Imaging Display : MADTL,F F [isw-imgdemo1] in use by :FLET..." and "Image listing :MADTL,F F 9 images." The main window shows patient information for MADTL,F F (DOB: 00/00/1924, SSN: 500-50-5000, NON-VETERAN (OTHER)). A table lists 9 images with their procedure dates and descriptions. Below this, there is a section for "MADTL,F F : Searching MUSE Database for EKG's...". The main display area shows "Vista CPRS in use by: Fletcher,Ross (isw-imgdemo1)" and "VISTA Imaging: MUSE EKG Display" for patient MADTL,F F (ID: 500505000) on 13-AUG-1997 at 09:45:00. The EKG display shows multiple leads (I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6) with a grid background. A vertical text label on the right side of the EKG reads "*\$1500505000 D7UDQ1B*". The interface includes various toolbars, a "Radiology" section, and a "Lotus ScreenCam" recording window at the bottom right.

#	PROC. DATE	PROCEDURE	CT	SHORT DESC
1	11/01/1999	XRAY	1	110199-38 UNLISTED RADIOLO
2	07/28/1997	COL	1	COLON 7/28/97
3	07/28/1997	ADVANCE DIRECTIVE	1	ADVANCE DIRECTIVE
4	07/28/1997	GEN. MED.	1	X-RAY CHEST SINGLE VIEW 7
5	07/27/1997	XRAY	6	072797-22 ANGIO VISCERAL S

openVISTA

VISTA Imaging Display : MADTL,F F (isw-imgdemo1) in use by :FLET...

Image listing :MADTL,F F 9 images.

#	PROC. DATE	PROCEDURE	Ct	SHORT DESC
1	11/01/1999	XRAY	1	110199-38 UNLISTED RADIOLO
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5	07/27/1997	XRAY	6	072797-22 ANGIO VISCERAL S

Patient: MADTL,F F 9 Images
00/00/1924 500-50-5000 NON-VETERAN (OTHER)

MADTL,F F : Searching MUSE Database for EKG's...

Abstracts : MADTL,F F 9 Images

Vista CPRS in use by: Fletcher,Ross (isw-imgdemo1)

MADTL,F F 500-50-5000 Visit Not Selected Primary Care Team Unassigned
.1924 (76) Provider: FLETCHER,ROSS

Order Sheet	All Services, Active Orders	Start / Stop	Provider	Nrs	Clk	Chart	Sts
Admit...	Vitals >> B/P BID	Start: 08/10/98 18:57 Stop: 08/13/98	Fletcher,R				active
Write Orders	Out. Med CLONIDINE 0.1MG TABS 1 TABLET(S) PO BID 0 refills		Fletcher,R				pendin
Allergies	METHYLDOPA 500 HCTZ 30MG TAB 1 TABLET(S) PO BID Quantity: 100 0 refills "UNSIGNED"		Fletcher,R				unrelea
Diet	DEXAMETHASONE 4MG S.T. 1 CAPSULE(S) PO BID Quantity: 60 6 refills		Fletcher,R				pendin
Meds, Inpatient	METHYLDOPA 500 HCTZ 30MG TAB 1 TABLET(S) PO BID Quantity: 90 5 refills		Fletcher,R				pendin
Meds, Outpatient	CLONIDINE 0.2MG TAB 1 TABLET(S) PO QD Quantity: 30 6 refills		Fletcher,R				pendin
IV Fluids	Lab CBC BLOOD SP LB #332	Start: 12/02/98	Imaging,T				pendin
Lab Tests	POTASSIUM BLOOD SERUM SP ONCE LB #319	Start: 10/19/98	Casugay,E				pendin
Radiology	CBC BLOOD SP LB #318	Start: 10/14/98	Fletcher,R				pendin
Consult	CBC BLOOD W/C LB #282	Start: 08/17/97	Carver,B				active
Procedure	CBC BLOOD W/C LB #283	Start: 08/17/97	Carver,B				active
Vitals	CBC BLOOD SP LB #288	Start: 08/13/97	Carver,B				active
Text Only Order	Imaging UNLISTED RADIOLOGIC PROCEDURE	Start: 11/01/99	Welby,M				active
	CT ABDOMEN W/CONT "UNSIGNED"	Start: Dec	Imaging,T				unrelea
	ABDOMEN 1 VIEW "UNSIGNED"	Start: Dec	Imaging,T				unrelea
	SHOULDER 2 OR MORE VIEWS	Start: 12/02/98	Imaging,T				pendin
	CHEST SINGLE VIEW "UNSIGNED"	Start: TODAY	Welby,M				unrelea
	CHEST 2 VIEWS PA&LAT "UNSIGNED"	Start: TODAY	Welby,M				unrelea
	CHEST SINGLE VIEW RIGHT	Start: 11/30/98	Welby,M				sched
	ABDOMEN 1 VIEW STAT	Start: 10/19/98	Casugay,E				active

Cover Sheet / Problems / Meds / Orders / Notes / Consults / D/C Summ / Labs / Reports

Lotus ScreenCam

openVISTA

VISTA Imaging Display : ALLGOOD,TAD (isw-imgdemo1) in use by ...

File Options View Reports Help System Manager

Patient: ALLGOOD,TAD 14 Images

08/15/1948 528-22-9876 YES SC VETERAN

6 Images for the selected TIU NOTE

Radiology Exam listing : ALLGOOD,TAD

#	Day-Case	Procedure	Exam Date	Ex
1	113098-41	MAGNETIC IMAGE BRAIN W/O CONTRAST	1998 - 11/30	WF
2	113098-40	CHEST 2 VIEWS PA&LAT	1998 - 11/30	WF
3	113098-39	CT ABDOMEN W/CONT	1998 - 11/30	WF
4	082402 40	DEF VIS 2 VIEWS	1997 - 08/24	WF

Vista CPRS in use by: Fletcher,Ross (isw-imgdemo1)

File Edit View Action Options Tools Help

ALLGOOD,TAD 1A 1502-C Primary Care Team Unassigned
528-22-9876 Aug 15,1948 (51) Provider: FLETCHER,ROSS Attending: Tedd,Dr

Default List Apr 04,00 NURSING NOTE, 1A, STUART FRANK

Apr 04,00 NURSING NOTE, 1A, STUART FRANK

TITLE: NURSING NOTE
DATE OF NOTE: APR 04, 2000@16:20 ENTRY DATE: APR 04, 2000@16:22
AUTHOR: FRANK,STUART EXP COSIGNER:
URGENCY: STATUS: COMPLETED

ASSESSMENT/FINDINGS:

Presents with multiple eschars on L foot associated with severe diffused erythema and edema of the foot accompanied by slight tenderness, dry, black, non-fluctuant eschars noted on heel, dorsum of foot and toes between the 1st and 2nd; and, 4th and 5th with blister on the base of the metatarsal, skin dry with lichenification, unable to appreciate pulses - recommend pressure relief with use of heel cushion and monitoring for changes; prevent injury/trauma to site; vascular lab consult

SUMMARY:
ABNORMAL

PROCEDURE SUMMARY:
L foot ulcers

TIU Document, Images -- ALLGOOD,TAD

6 Images


ALLGOOD,TAD NURSING NOTE Apr 04, 2000@16:22 6 Images

1 NURSING NOTE NURSING NOTE 04/C 2 NURSING NOTE NURSING NOTE 04/C 3 NURSING NOTE NURSING NOTE 04/C 4 NURSING NOTE NURSING NOTE 04/C 5 NURSING NOTE NURSING NOTE 04/C 6 NURSING NOTE NURSING NOTE 04/C

openVISTA

VISTA Imaging Display : MADTL,F F (isw-imgdemo1) in use by :FLET...

File Options View Reports Help System Manager



Patient: MADTL,F F 9 Images
00/00/1924 500-50-5000 NON-VETERAN (OTHER)



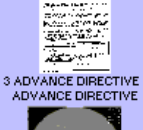




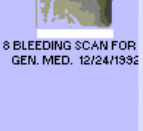

MADTL,F F : Searching MUSE Database for EKG's...

Image listing :MADTL,F F 9 images.

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4	07/28/1997	GEN. MED.	1	X-RAY CHEST SINGLE VIEW 7
5	07/27/1997	XRAY	6	072797-22 ANGIO VISCERAL S

9 Abstracts : MADTL,F F

9 Images

Vista CPRS in use by: Fletcher,Ross (isw-imgdemo1)

File Edit View Tools Help

MADTL,F F 500-50-5000 .1924 (76) Visit Not Selected Provider: FLETCHER,ROSS Primary Care Team Unassigned

Lab Results Laboratory Results - Worksheet - All Results

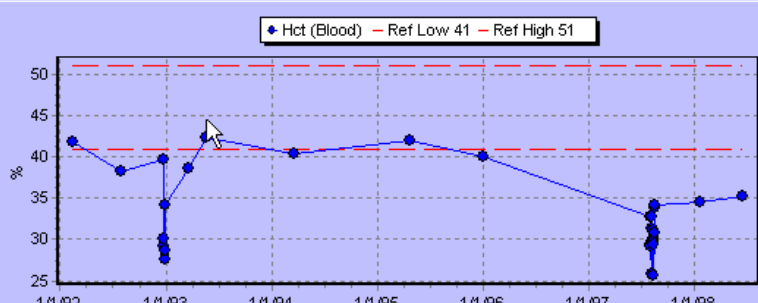
Table Format: Horizontal Vertical

Other Formats: Comments Graph

Abnormal Results Only Zoom 3D Values

Date/Time	Specimen	WBC	RBC	HGB	HCT	MCV	MCH	MCHC	RDW
06/18/98 00:00	Blood	7.1	5.5	11.4 L	35.3 L				
01/21/98 00:00	Blood	8.1	5.5	11.6 L	34.6 L	90.4			
01/21/98 00:00	Blood	8.1		11.6 L	34.6 L	90.4			
08/17/97 00:00	Blood	13.7 H		11.3 L	34.1 L	90			
08/16/97 00:00	Blood	15.2 H		11.4 L	33.9 L	89.2			

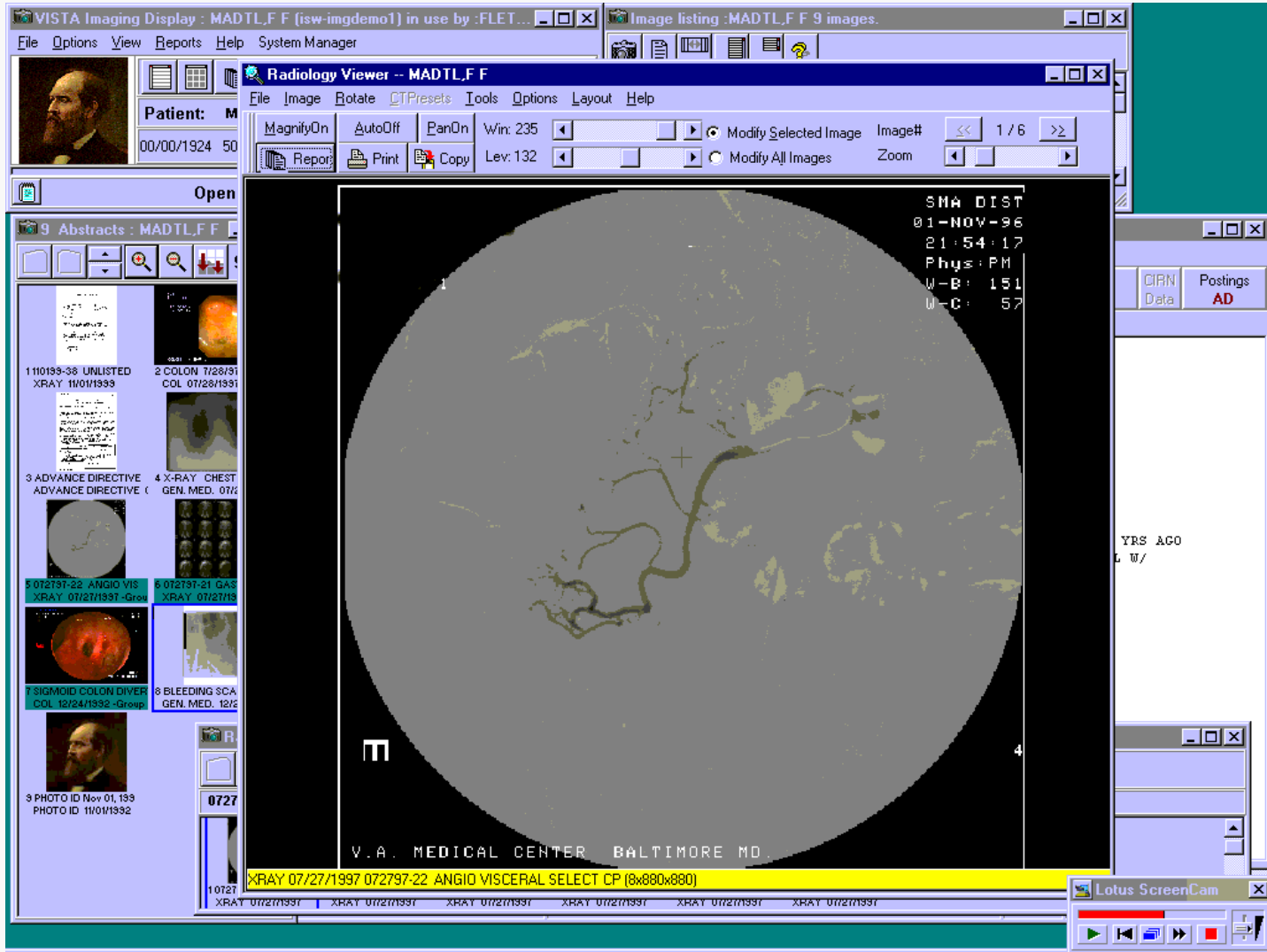
Graph: Hct (Blood) - Ref Low 41 - Ref High 51



KEY: "L" = Abnormal Low, "H" = Abnormal High, "!!" = Critical Value, "!!!" = Comments on Specimen

Cover Sheet Problems Meds Orders Notes Consults D/C Summ Labs Reports

openVISTA



openVISTA

VISTA Imaging Display : MADTL, F (isw-imgdemo1) in use by :FLET... Image listing :MADTL, F 9 images.

File Options View Reports Help System Manager

Patient: MADTL, F
00/00/1924 500-50-5000 NON-VE1

1 Images for the selected 1

Abstracts : MADTL, F 9 Images

Document Image -- MADTL, F

XRAY 11/01/1999 110199-38 UNLISTED RADIOLOGIC PROCEDURE

WRAMC / RADIOLOGY

NUCLEAR MEDICINE REPORT

CASE NO: 482473
PATIENT NAME: MADTL, FRANK
CLINIC/WARD: 3EA, MED
EXAMINATION: NUCLEAR MEDICINE SCAN
DATE REPORTED: NOV 1, 1999
TECHNICIAN: DEHILL, JOE

SSN: 500-50-5000
REQUESTOR: SANEL, LOUISE
DATE OF EXAM: OCT 26, 1999 11:10
DATE ENTERED: NOV 1, 1999
AGE: 68

Clinical History: R/O of bleed

Report:
Mr. Madtl was referred to the Walter Read Army Medical Center for a Nuclear Medicine Scan. The full report is attached to this report.

Impression:
The GI bleeding scan is positive with focal collection of the radioactivity in the left upper quadrant of the abdomen on the 60 minutes images.

Radiology Exam, Images -- MADTL, F

110199-38 UNLISTED RADIOLOGIC PROCEDURE 2991101.1418 1 Images

110199-38 UNLISTED XRAY 11/01/1999

Lotus ScreenCam

openVISTA

The screenshot displays the openVISTA medical imaging software interface. The main window is titled "VISTA Imaging Display : ALLGOOD,TAD (isw-imgdemo1) in use by ...". It features a menu bar with "File", "Options", "View", "Reports", "Help", and "System Manager". Below the menu bar, there are icons for various functions. The patient information section shows:

Patient: ALLGOOD,TAD 14 Images
 08/15/1948 528-22-9876 YES SC VETERAN

A "Radiology Exam listing" window is open, showing a table of exams for ALLGOOD,TAD:

#	Day-Case	Procedure	Exam Date	Ex
1	113098-41	MAGNETIC IMAGE BRAIN W/O CONTRAST	1998 - 11/30	WF
2	113098-40	CHEST 2 VIEWS PA&LAT	1998 - 11/30	WF
3	113098-39	CT ABDOMEN W/CONT	1998 - 11/30	WF
4	082402-40	DEF VISC 2 VIEWS	1997 - 08/24	WF

The main display area is titled "Full Resolution View -- ALLGOOD,TAD" and shows a large medical image of a brain scan. The image has a toolbar with "Brightness" (100), "Contrast" (100), and "Zoom" (100) sliders, along with other icons. A "Default List" is visible on the left side of the main window, listing various medical notes and referrals:

- Apr 04,00 NURSING NOTE, 1A, S
- Apr 03,00 EXTERNAL REFERRAL
- Apr 03,00 PRE ANESTHETIC, 1A,
- Apr 03,00 INTERIM PROGRESS M
- Apr 03,00 NURSING NOTE, 1A, S
- Apr 03,00 POST ANESTHETIC, 1A,
- Apr 03,00 OPHTHMOLOGY, 1A, S
- Apr 03,00 INTERSERVICE TRANS
- Apr 03,00 EXTERNAL REFERRAL
- Apr 03,00 NURSING NOTE, 1A, S
- Apr 03,00 ADVANCE DIRECTIVE
- Nov 01,99 INTERIM PROGRESS M
- Dec 29,93 + General Note, 1A, TAM
- Dec 15,93 General Note, 1A, AL EE

At the bottom of the interface, there is a "3 Group abstracts - ALLGO" window and a "LAB 04/04/2000 EM 00 1 - 3 Images" window showing three small thumbnail images of the brain scan. A "Lotus ScreenCam" window is also visible in the bottom right corner.

TORCH

Trusted **O**pen source **R**ecords for **C**are & **H**ealth

- TORCH's unique approach to the electronic health record problem is defined by viewing it as a content management problem.
- Interoperability with other applications is addressed through the ability to rapidly build custom interfaces to any system.

Copyright 2003, Open Paradigms,LLC

TORCH

Trusted **O**pen source **R**ecords for **C**are & **H**ealth

- TORCH fully leverages the open source philosophy by building on tried and tested open source applications.
- This gives the effect of many more developers and many more installations for a large part of TORCH's components.
- This significantly reduces the amount of effort required to maintain TORCH.

Copyright 2003, Open Paradigms.LLC

TORCH

Trusted **O**pen source **R**ecords for **C**are & **H**ealth

- Screen layouts are easily customized via standard HTML editors.
- Reporting can be performed with custom Python scripts and/or SQL.
- Custom components can be added via Archetype declarations and built-in widgets provide viewing, editing and i18n support.

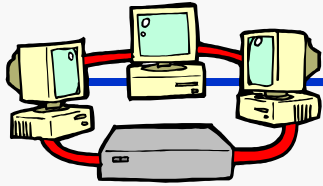
Copyright 2003, Open Paradigms.LLC

OSCAR

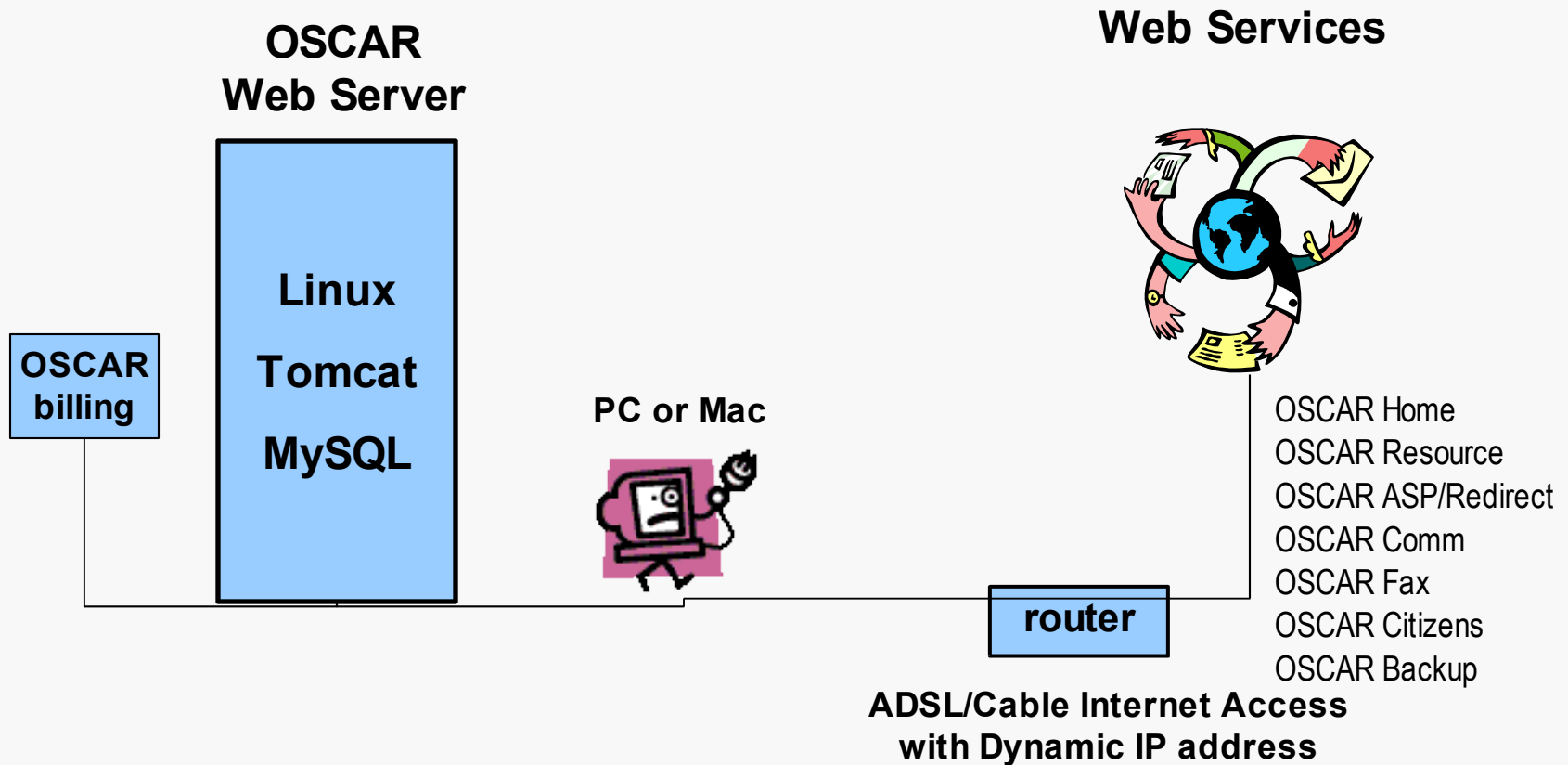
An electronic health record and practice management system for primary care and community based care.
Developed by the Department of Family Medicine
McMaster University, Hamilton Ontario

What is OSCAR?

- OSCAR is a set of Clinic Applications, Clinic Resources, and electronic patient records, developed using Open Source tools (Linux, Tomcat, MySQL, Zope)
- OSCAR facilitates Clinical Decision Support and Evidence Based Medicine
- OSCAR provides tools for clinic operations (appointments, encounters, prescriptions, lab results, roster, billing, electronic patient record)
- OSCAR is web based, to provide offsite access
- This work is funded by a grant from the Ministry of Health of Ontario, to support the requirements of Primary Care Reform



Typical OSCAR Clinic Set-up



Current OSCAR Users

- Maternity Center of Hamilton (10 Doctors)
- Joint PCN On-call group (18 Doctors & 35 Residents)
- Hamilton Midwives (7 midwives)
- Wellington Nursing Home (2 Doctors)
- Stonechurch Family Health Centre (28 Doctors & Residents)
- McMaster Family Practice (24 Doctors & Residents)
- Solo Obstetrics Specialist
- Hamilton Stroke Prevention Clinic
- Known installations in Toronto, Vancouver, US cities, Australia, Columbia, Brazil, and South Africa

Development Plans

- Clinical Applications:
 - Phase I - Office Management
 - Phase II - EMR
 - Phase III - Research & Evaluation
 - Phase IV - Citizen Interactive
- Clinical Resource
 - resource database
 - recruitment of content experts
 - Evidence Based decision support tools
- Open Source
 - copyright & licensing
 - software release: Hollywood November 17, 2002

LOGIN

User Name:

Password:

PIN: for Internet users

OSCAR is open source software. You are welcome to redistribute it under certain conditions.

The software at this point is tested for the Explorer browser version 5.5 and later for other browsers, e.g. Netscape Navigator. The resolution of the screen should be at least 1024x768. This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

[Click here for details.](#)

PEMBERTON HEALTH CENTRE, BC



Open Source Clinical Application Resource

Mel Gibson		David Chan		Mickey Mouse		trudy chiswell-resident	
08:00	P	08:00		08:00		08:00	
08:10	P	08:10		08:10		08:10	
08:20	E	08:20		08:20		08:20	
08:30	R	08:30		08:30		08:30	
08:40	R	08:40		08:40		08:40	
08:50	S	08:50		08:50		08:50	
09:00	O	09:00		09:00		09:00	
09:10	O	09:10		09:10		09:10	
09:20	N	09:20		09:20		09:20	
09:30	A	09:30		09:30		09:30	
09:40	A	09:40		09:40		09:40	
09:50	L	09:50		09:50	1	09:50	
10:00		10:00		10:00	1	10:00	
10:10		10:10		10:10	1	10:10	
10:20	D	10:20		10:20	1	10:20	
10:30	A	10:30		10:30	1	10:30	
10:40	A	10:40		10:40	1	10:40	
10:50	Y	10:50		10:50	1	10:50	
11:00		11:00		11:00	1	11:00	
11:10		11:10		11:10	1	11:10	
11:20	P	11:20		11:20	1	11:20	
11:30	E	11:30		11:30	1	11:30	
11:40	E	11:40		11:40	1	11:40	
11:50	R	11:50		11:50	1	11:50	
12:00	S	12:00		12:00	1	12:00	
12:10	S	12:10		12:10	1	12:10	
12:20	O	12:20		12:20	1	12:20	
12:30	N	12:30		12:30		12:30	
12:40	N	12:40		12:40		12:40	
12:50	A	12:50		12:50		12:50	
13:00	L	13:00		13:00		13:00	
13:10	L	13:10		13:10		13:10	

- # Abelmed, Jen |E|AR|B| M|Rx
- ! Caslim, Jess |E|AR|B| M|Rx
- # Eaxsepdl, Jo |E|AR|B| M|Rx

Eaxsepdl, John
reason: Headache
notes:

Concluding Comments

“Open Source Is A Natural Fit for Health Care”

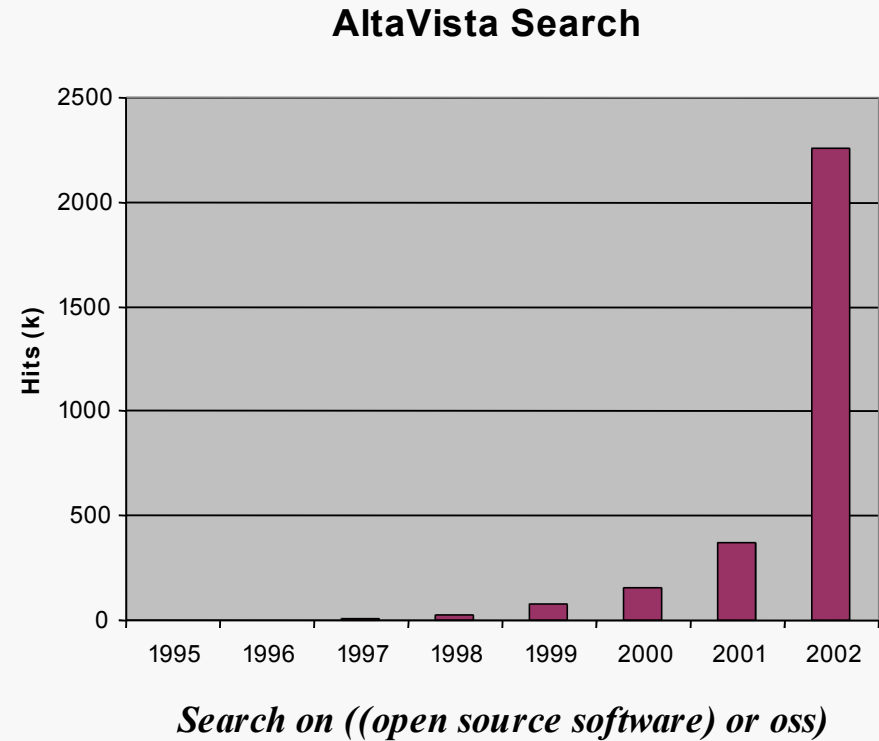
Driven More by Economics Than Altruism

- Market forces drive price to the marginal cost of production
C. Shapiro and H. Varian, Information Rules, Harvard Business School Press, 1999
- The cost of producing a second copy of software is close to Zero
- The network effect of the internet accelerates this trend

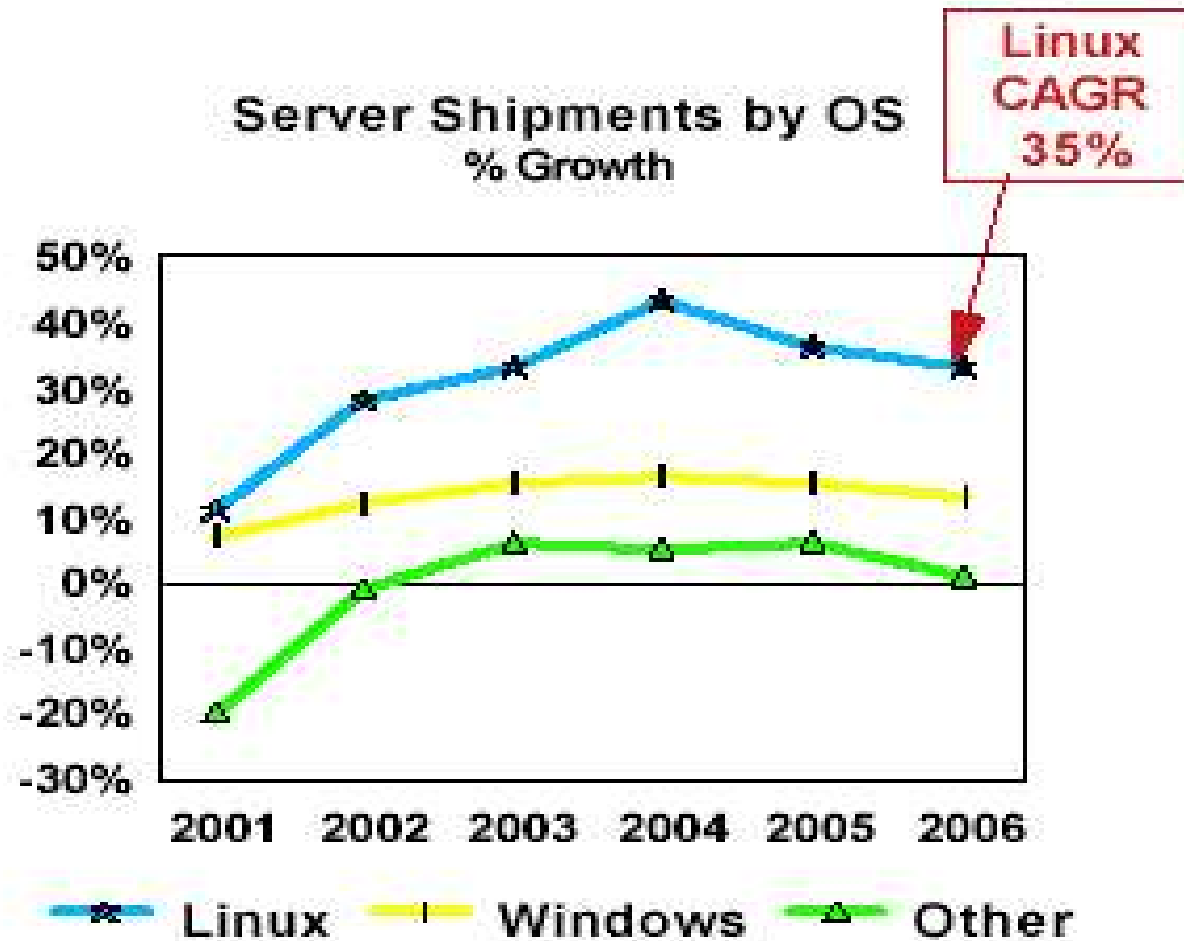
Open Source is the next step in software business models

Trends

- Most indicators are growing exponentially
- No limits to growth discovered to date



Trends



IDC, Enterprise Server Fundamentals, March 2002

Trends: Government Adoption Increasing

As of June 2003, over 70 policy proposals, positions or actual government decisions have been made concerning open source software (OSS) in some 24 countries around the world.

- Countries are using OSS as a strategic tool to overcome legal and economic barriers of proprietary software.
- City of Munich > Linux/OpenOffice > “14,000 PC systems and Notebooks, over 16,000 users
- Beijing municipal government
- Japan to use Linux to manage salary and other personnel data for the nation's 800,000 central government employees
- Korea migrating 120,000 civil servants, 23% of its installed Microsoft systems, to the Korean Linux distribution
- Bioninformatics 80-95% open source - SARS genome sequencing done on Linux cluster

Open Source: A Natural Fit for International Collaboration in Health and Other Sectors

- Fewer to no Intellectual Property issues
- Cumulative Innovation - leverages investment of the global community
- You can start small
- You can reuse what you and others already have developed
- Naturally leads to standardization
- Can focus on clinical outcomes
- Directly addresses “Digital Divide” issues

OSHCA
Open Source Health Care
Alliance

www.oshca.net