

Accelerator management with Web-based GIS

*A.Yamashita, Y.Ishizawa,
M.Takeuchi and T.Ohata*

SPRING-8, Japan

PCaPAC 2006@JLab

Outline

- Google map
- What is GIS?
- What we want to with GIS for SPring-8
- MapServer
- Two systems using MapServer
 - Equipment location manager
 - Real time alarm display
- Conclusion

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QUESTION

QUESTION

Do you like

Google map?

I like it.

I wish I could
have Google
map for
SPring-8.

SPring-8

- 4 + 1 accelerator complex
 - Injector linac
 - Booster synchrotron
 - 8GeV storage ring
 - 1.5GeV New Subaru
 - +
 - SCSS prototype accelerator
- 266 VME cpus
- 87 PLC's
- Distributed in 1kmx1km area.

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SPring-8

An aerial photograph of the SPring-8 synchrotron facility. The main feature is a large, circular, multi-layered structure, which is the 8 GeV storage ring, highlighted with a thick yellow border. The facility is surrounded by greenery and some buildings. The text 'SPring-8' is overlaid in white at the top center.

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We build our own map system

http://smap - test - Mozilla Firefox

PHP/MapServer Round Watch for SPring-8 Control Gr

Map window size Small

Scale 1: 14789463 Zoom ±

X: 407826 Y: 295652

0 94 188 282 376 m

p. mapper

- vme
 - sr_vme
 - bl_vme
 - id_vme
- plc
 - bl_plc
 - bl_fe
 - bl_plc_exit
 - bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - BL_HARD_mainte
 - PLC_SOFT_mainte
 - DI_VME_Backlog

DL

Search for

Geo-data source: DCW: geoTorrent

Map Server

Done

ICALEPCS 2005

- Evaluating the Potential of Commercial GIS for Accelerator Configuration Management

*T. Larrieu, Y. Roblin, K. White,
R. Slominski*

Jefferson Lab, USA

What is GIS?

- *from Wikipedia*
- **Geographic Information System (GIS) is a system for creating, storing, analyzing and managing spatial data and associated attributes.**
- In the strictest sense, it is a computer system capable of integrating, storing, editing, analyzing, sharing, and displaying geographically-referenced information.
- In a more generic sense, GIS is a tool that allows users to create interactive queries (user created searches), analyze the spatial information, and edit data.

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What we want with GIS for SPring-8

- Locate equipment distributed in the SPring-8 site.
 - Where is the X?
 - Information integration.
 - Where is the drawing of X?
 - Where is the maintenance history of X?
 -
 - Map based is more straightforward than text based system
 - Share information from everywhere on the net.
- Real-time status display.

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An episode.

- A VME cpu on beam-line 40XU got truble.

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- A VME cpu on beam-line 40XU got trouble.
- "Go to the 40XU and reset it."
- The operator reset another VME CPU on 40B2 which was close to 40XU.
- VME map would have prevented such a trouble.

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- **Real-time status display.**
 - **Google map does not have**

What we want with GIS for SPring-8. Technical requirement.

- **Google map like**
 - Web based.
 - No client application installation.
 - Access from everywhere.
 - zooming, panning, multi-layer
- Open source
- Easy to manage
 - Installation
 - Modification
 - Configuration
 - Data entry

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- Web based map display system like google map.
- Developed at University of Minnesota.
 - Originally developed for forest resource management
 - <http://mapserver.gis.umn.edu/>
- Open source
- Multi data sources
 - CAD data, image data, databases...
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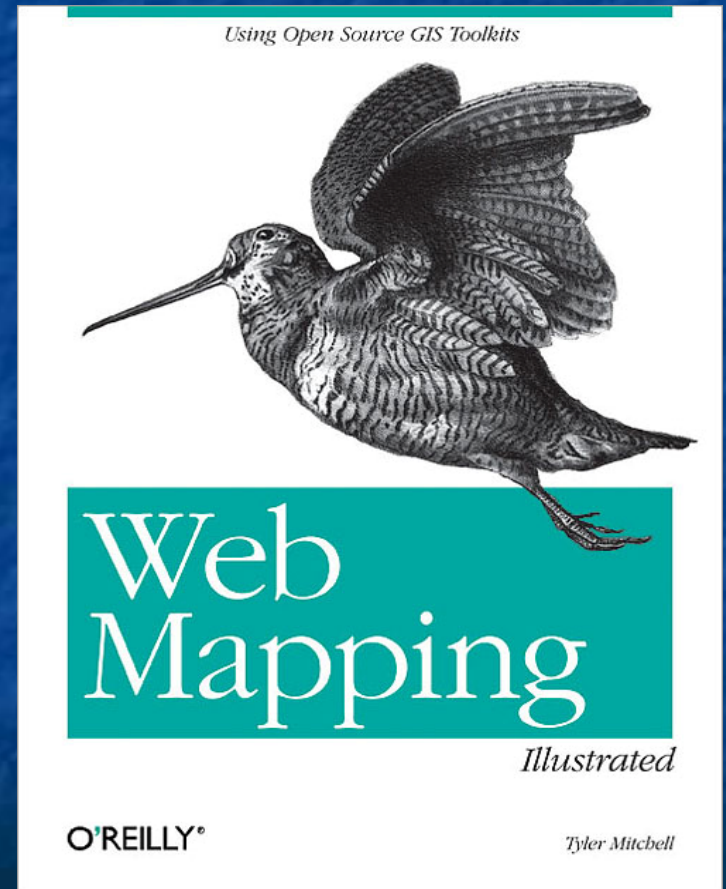
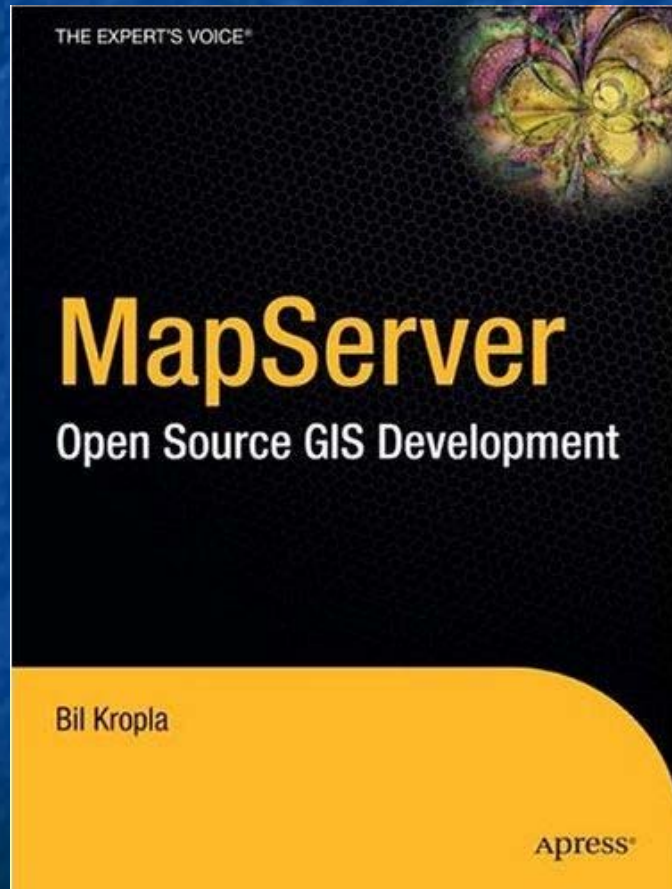
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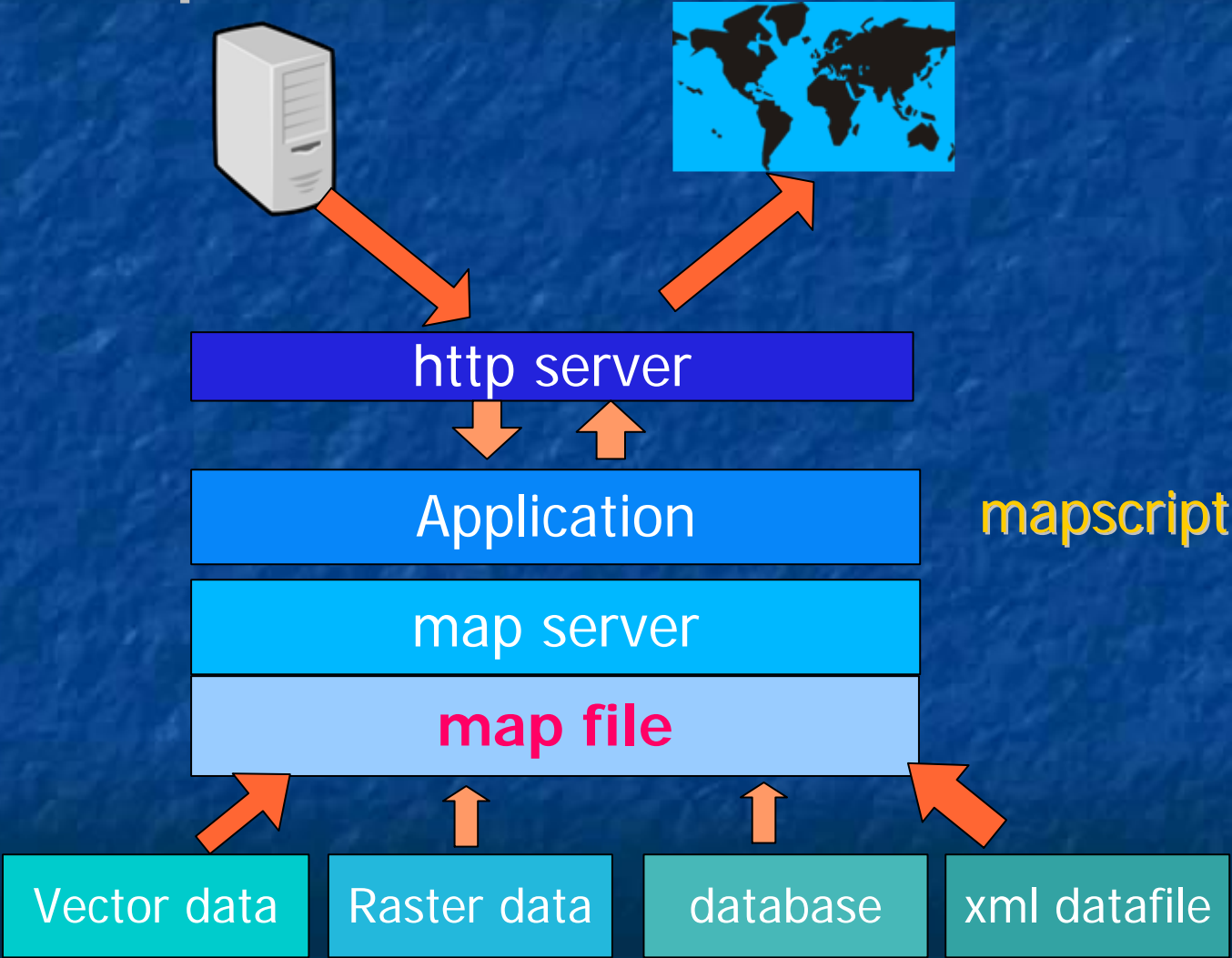
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MapSever two books



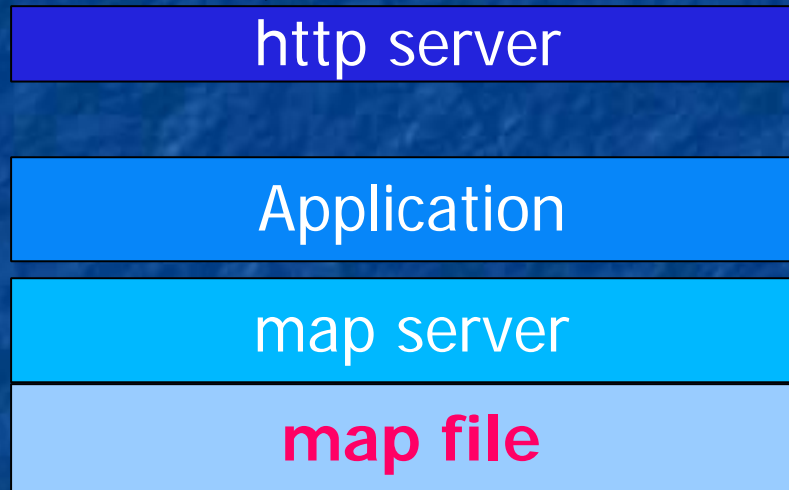
MapServer mechanism



MapServer mechanism



HTTP request



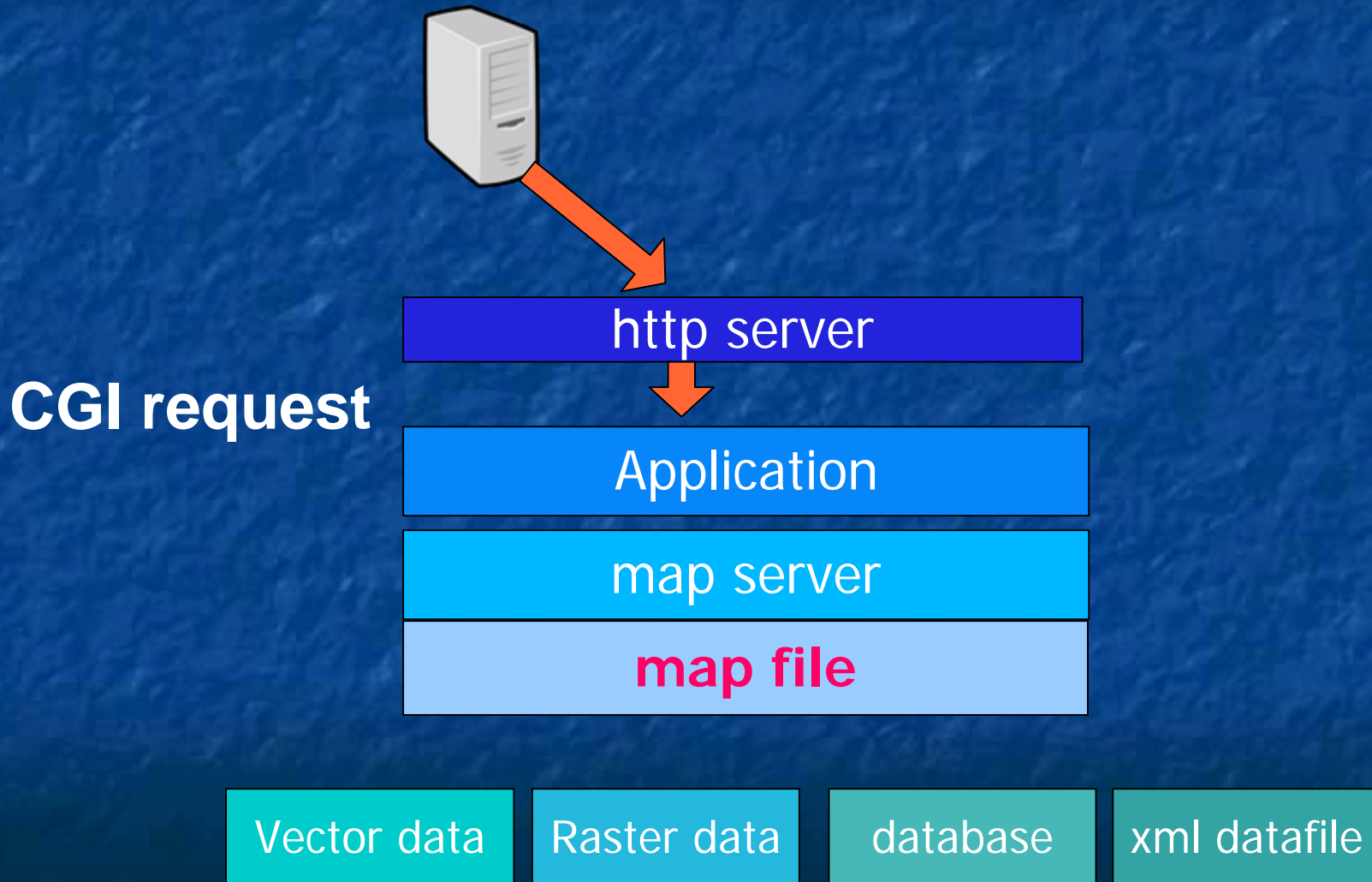
Vector data

Raster data

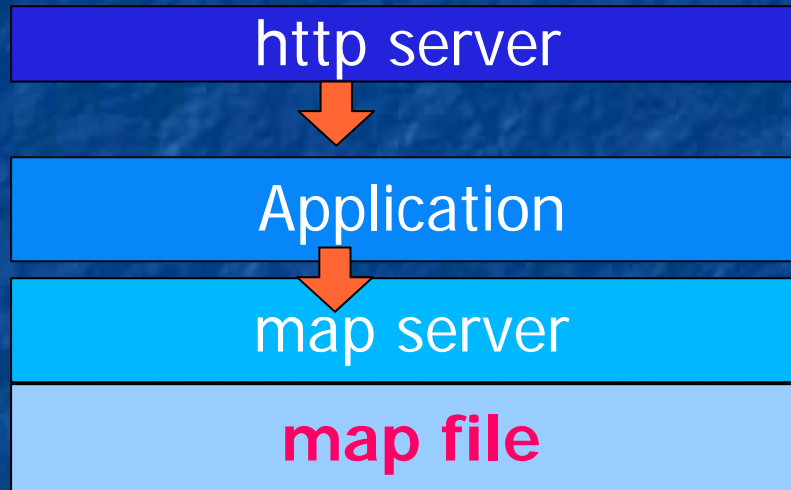
database

xml datafile

MapServer mechanism



MapServer mechanism



API call
by
mapscript
PHP,perl,
java python

Vector data

Raster data

database

xml datafile

MapServer mechanism



http server



Application



map server

map file

Vector data

Raster data

database

xml datafile

Mapfile

- **Configuration file**
 - Text file format.
- Integrate data files and database
 - Defines location of data.
 - Image size
 - Layer
 - Font
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 - etc.

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Mapfile example

MAP

```
NAME "MapTest"  
STATUS ON  
IMAGECOLOR 255 254 203  
IMAGETYPE gif  
EXTENT -500000 -600000 1300000 800000  
UNITS meters  
SHAPEPATH "D:/shp_data/"  
SYMBOLSET "D:/symbols/symbols35.sym"  
FONTSET "D:/etc/fonts.txt"  
RESOLUTION 96  
INTERLACE OFF
```

```
#####
```

WEB

```
TEMPLATE "map.html"  
IMAGEPATH "D:/ms4w/tmp/ms_tmp/"  
IMAGEURL "/ms_tmp/"  
METADATA  
END # Metadata
```

```
END
```

Mapfile example

LEGEND

```
STATUS ON
POSITION UL
KEYSIZE 18 12
LABEL
    TYPE BITMAP
    SIZE MEDIUM
    COLOR 0 0 89
```

END

END # Legend

#####

REFERENCE

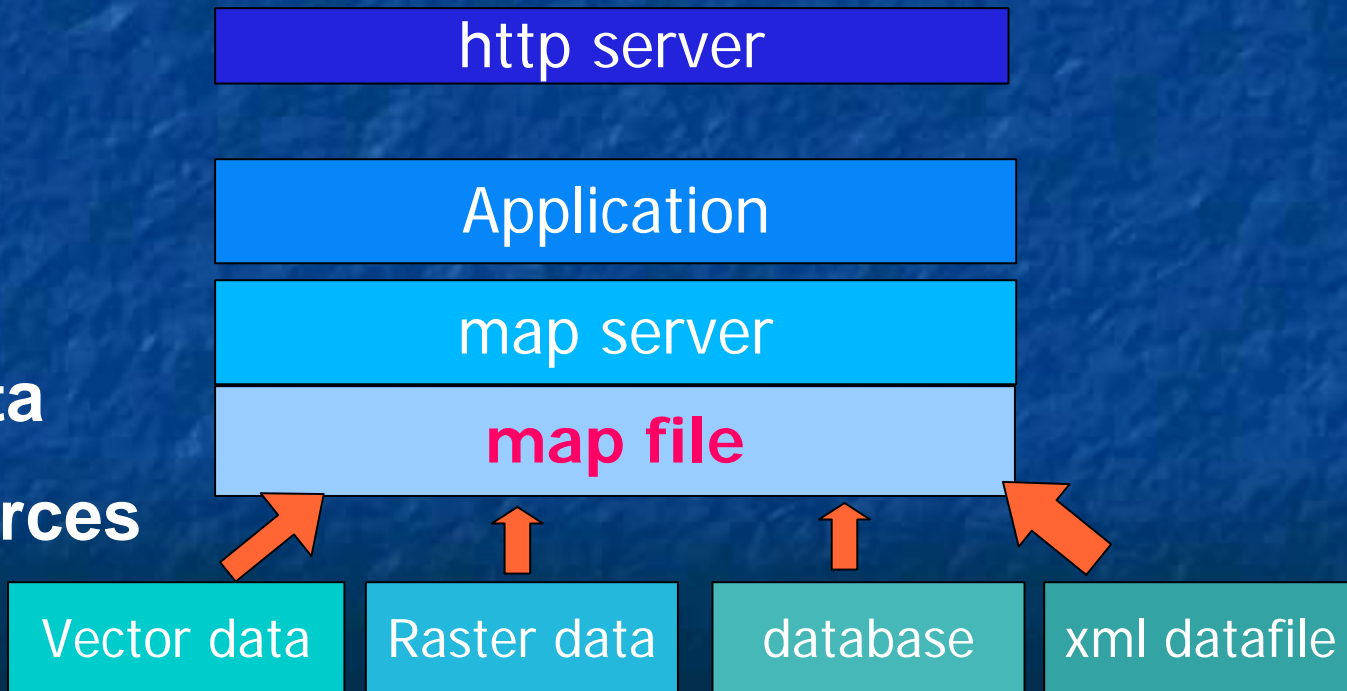
```
IMAGE ./images/sp8.bmp
EXTENT -500000. -600000. 1300000. 800000.
SIZE 150 128
STATUS ON
COLOR 200 200 200
OUTLINECOLOR 255 0 0
```

END

MapServer mechanism



Read data
from
data sources



Data sources

- Vector data
 - Standard data format
 - Shape file
 - CAD data (.dxf file converted shape file)
 - MapinfoTAB
- Raster data
 - jpg, png, gif, tiff...
- Databases
 - MySQL, postgresql, Oracle...
- Files
 - Gxml (geographic XML)

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MapServer mechanism



http server

generates
temporary
image file



Application

map server

map file

Vector data

Raster data

database

xml datafile

MapSever applications

- **Open source MapSever applications**
- **Mapscript application(server) + Javascript (client)**
 - p.mapper
 - ka-map
 - many more.
- **Standalone (no Web) systems are also available.**

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ka-map


The screenshot displays the ka-map web application interface. At the top, there is a scale bar from 0 to 7500 km and a dropdown menu set to "World". The main map area shows a world map with countries labeled: Canada, United States, Mexico, Peru, Brazil, Argentina, Greenland, Sweden, Russia, Kazakhstan, Iran, Pakistan, India, China, Libya, Saudi Arabia, Sudan, Congo (Kinshasa), and South Africa. A red box highlights a specific region on the map. To the right of the map, there is a panel showing the "current scale" as 1:100000000 and a smaller inset map. Below the inset map is a "Layers" panel with a "Base" layer selected. The bottom left corner features a logo for "Powered by ka-Map".

cartoweb3

File Edit View Go Bookmarks Tools Help

http://cartoweb.org/demos/demoCW3.php

SUSE mozilla.org

 GIS + IT Engineering

CartoWeb3 - Demonstration

welcome anonymous - [Login](#)

Print About Help Viewer

Themes Search Outline Query

Background

- None
- Vector
- Raster


Human activities

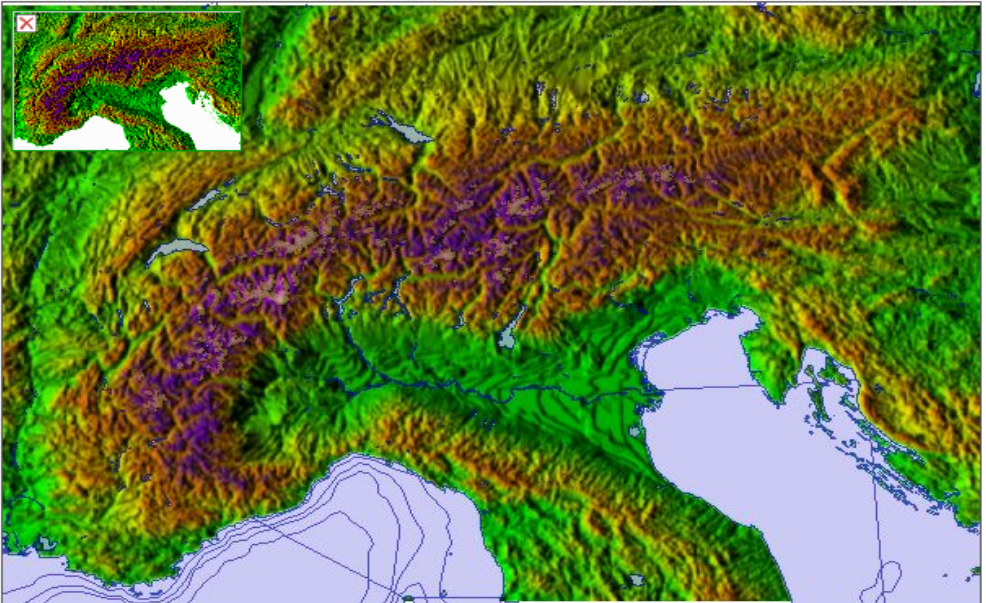
- Towns
- Transports

Category

Hydrology

- Iceland
- Rivers
- Lakes

?  OK



Coords (m): 8768.19 / 48338.52

0 120 240 360 480 km

Scale :

Mapsize : 600x420

Done

mapblendar

File Edit View Go Bookmarks Tools Help

http://wms1.ccgis.de/mapbender_wesseling/spa/main.php

SUSE mozilla.org

Straßen und Adressen:

ok
Wahl

ABCDEFGHIJKLMN
OPQRSTUVWXYZ

Themenauswahl

- Städtische Einrichtungen
- öffentliche Einrichtungen
- Jugend
- Bildung
- Gewerbe
- Freizeit
- Verkehr
- Sonstiges
- Wahlen
- Planen und Bauen
- Denkmalschutz

Suchen: ok

Mapbender

Stadt Wesseling
1 km

Legende

Stadtkarte

Done

Detailed description: The image shows a screenshot of a web browser displaying the 'mapbender' application. The browser's address bar shows the URL 'http://wms1.ccgis.de/mapbender_wesseling/spa/main.php'. The page title is 'SUSE mozilla.org'. The main content area is divided into several sections. On the left, there is a search and navigation panel. At the top of this panel, it says 'Straßen und Adressen:' followed by an empty search input field and 'ok' and 'Wahl' buttons. Below this is an alphabetical index 'ABCDEFGHIJKLMN' and 'OPQRSTUVWXYZ'. Further down is a 'Themenauswahl' (Theme Selection) section with a list of categories, each preceded by a plus sign in a square: 'Städtische Einrichtungen', 'öffentliche Einrichtungen', 'Jugend', 'Bildung', 'Gewerbe', 'Freizeit', 'Verkehr', 'Sonstiges', 'Wahlen', 'Planen und Bauen', and 'Denkmalschutz'. At the bottom of this panel is a search box labeled 'Suchen:' with an 'ok' button. The main part of the page is a map titled 'Mapbender' showing a detailed view of a city area, identified as 'Stadt Wesseling' in the bottom left corner of the map. The map features various colored overlays representing different thematic layers: orange for buildings, green for parks and green spaces, blue for water bodies (a large river is prominent), and grey for roads and infrastructure. A scale bar below the map indicates '1 km'. To the right of the map is a 'Legende' (Legend) section with a small icon of a house and a square with the letter 'R'. At the bottom right of the map area, there is a dropdown menu currently set to 'Stadtkarte'. The browser's status bar at the very bottom shows the word 'Done'.

musmap

Musmap 0.7.0-dev - Mozilla Firefox

http://musmap.sourceforge.net/todo/

Requêtes ... Profil

Recharger la légende

Toutes les couches

- adresse
- arbre
- bassin
- courseau
- parcqa
- parcvi
- Affectation du sol
 - équipements publics
 - Jardins
 - Seine et canaux
 - Autres affectations
- emprise bâtie
 - Cours intérieures
 - Emprise bâtie
- STDF 2000
- mètre
- station
- Ligne de mètre
 - RER
 - Metro
 - Tramway
- voie
- segmtsrv

x=596782
y=129267

Transfert des données depuis 127.0.0.1...

The Pink Floyd - 02 THE THIN ICE

primagis

File Edit View Go Bookmarks Tools Help

http://www.primagis.fi/demo

SUSE mozilla.org

Prima GIS

Home » Demo

Home » Demo

Search this site

Advanced search

zcologia

- Open Source Proliferation
- Dirt Simple Geo for Plone
- I-cubed Imagery in MapQuest
- Python Quadtree
- Geo at the Plone Conference
- DebianGIS, GEOS, MapServer

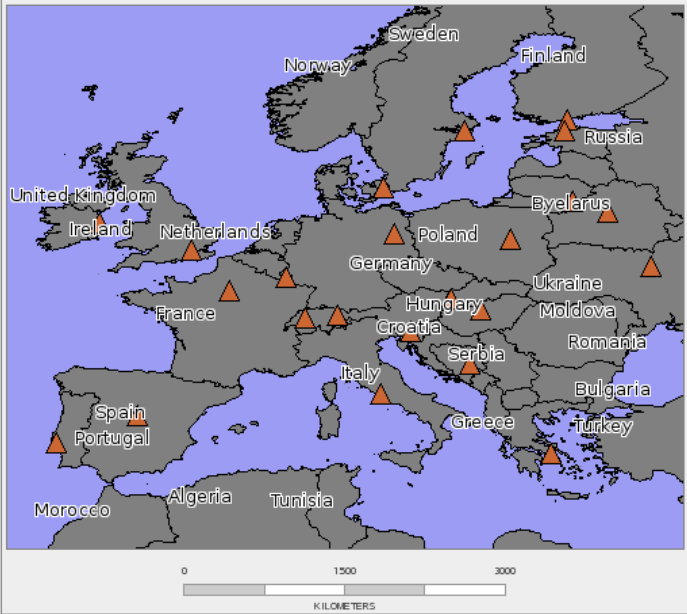
Recent Items

No items published or changed since your last log-in. More...

Home » Demo

Demo

» Go to view.. Small | Medium | Large



Legend

- ▲ European capitals
- PrimaGIS Events

Layers

- World political borders
- JPL Landsat Global Mosaic (WMS)
- Mapserver users (WFS)
- European Capitals

Done

intergrated
into plone

MapSever applications

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p.mapper

- Framework
 - PHP (server).
 - Javascript (client)
- Rich functions.
 - Pan/zoom .
 - Reference map
 - Query functions (identify, select, search)
 - Print functions: HTML and PDF

p.mapper

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 - PHP (server).
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Accelerator management with MapServer

- P.mapper used
 - Most function-rich
- Two applications.
 - Equipment management for SPring-8
 - Real-time alarm display for SCSS prototype

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- **Equipment management**
 - VME cpu and PLC
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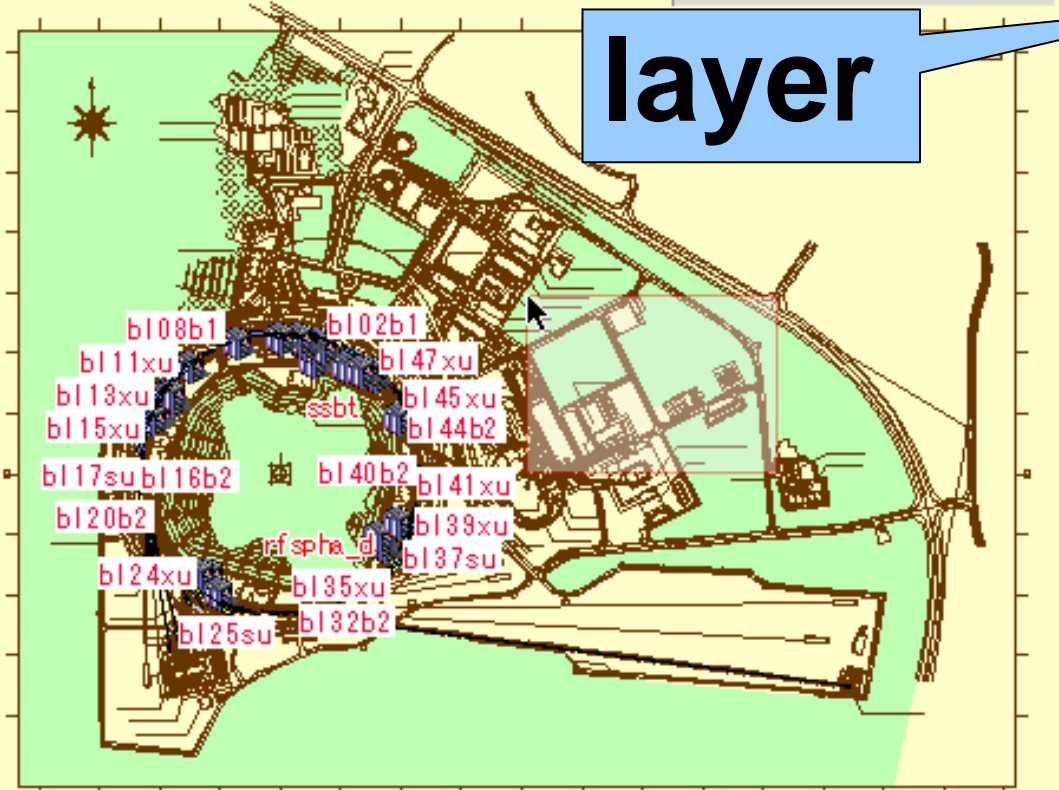
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Scale 1: 14789463 Zoom ±

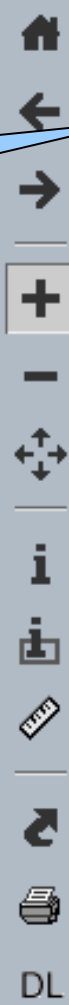
X: 407826 Y: 295652

layer



0 94 188 282 376 m

p.mapper



- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - + BL_VME_Baseless

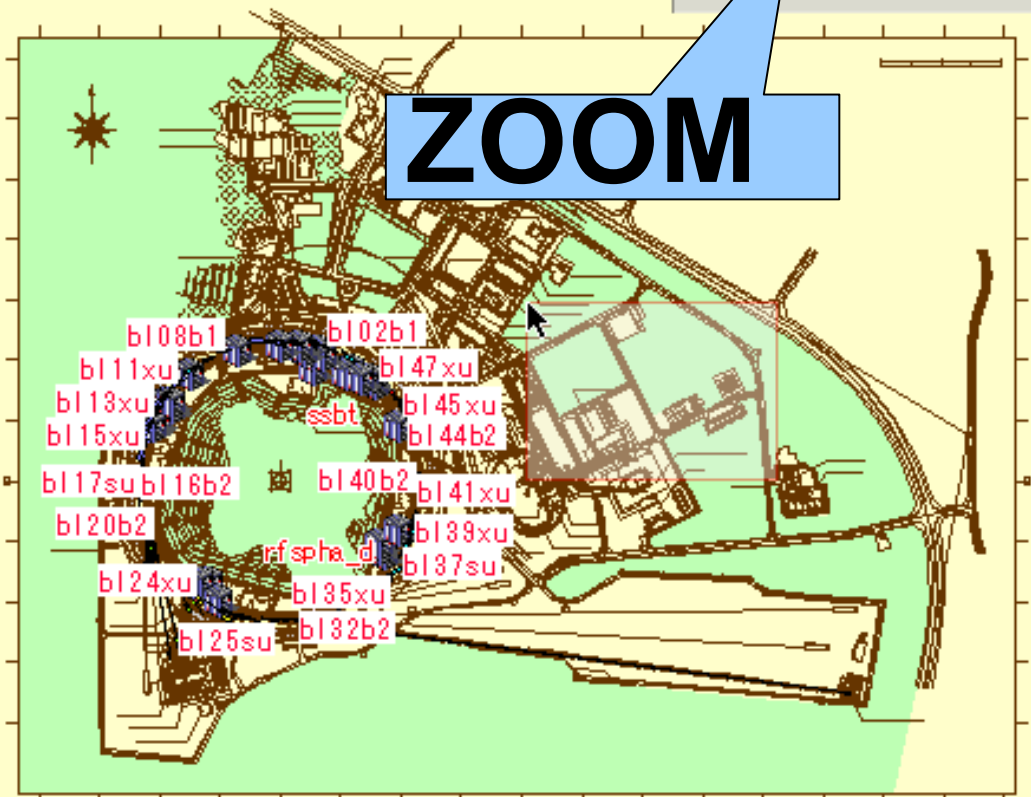


Search for

Scale 1: 14789463 Zoom ±

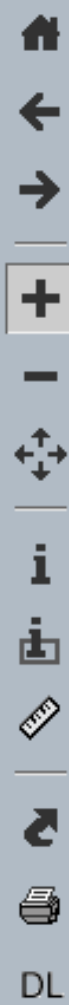
X: 826 Y: 295652

ZOOM



0 94 188 282 376 m

p.mapper



- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - + BL_VME_Backlog



Search for

Scale 1: 14789463 Zoom ±

X: 407826 Y: 295652



Legend panel showing layer visibility options:

- vme
 - sr_vme
 - bl_vme
 - id_vme
- plc
 - bl_plc
 - bl_fe
 - bl_plc_exit
 - bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - BL_HARD_mainte
 - PLC_SOFT_mainte
 - BL_VME_Base...

Thumbnail map view showing a zoomed-in section of the main map.

0 94

p.mapper

reference map

Search for

Scale 1: 14789463 Zoom ±

X: 266957 Y: 49130



- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - + BL_VME_Recess



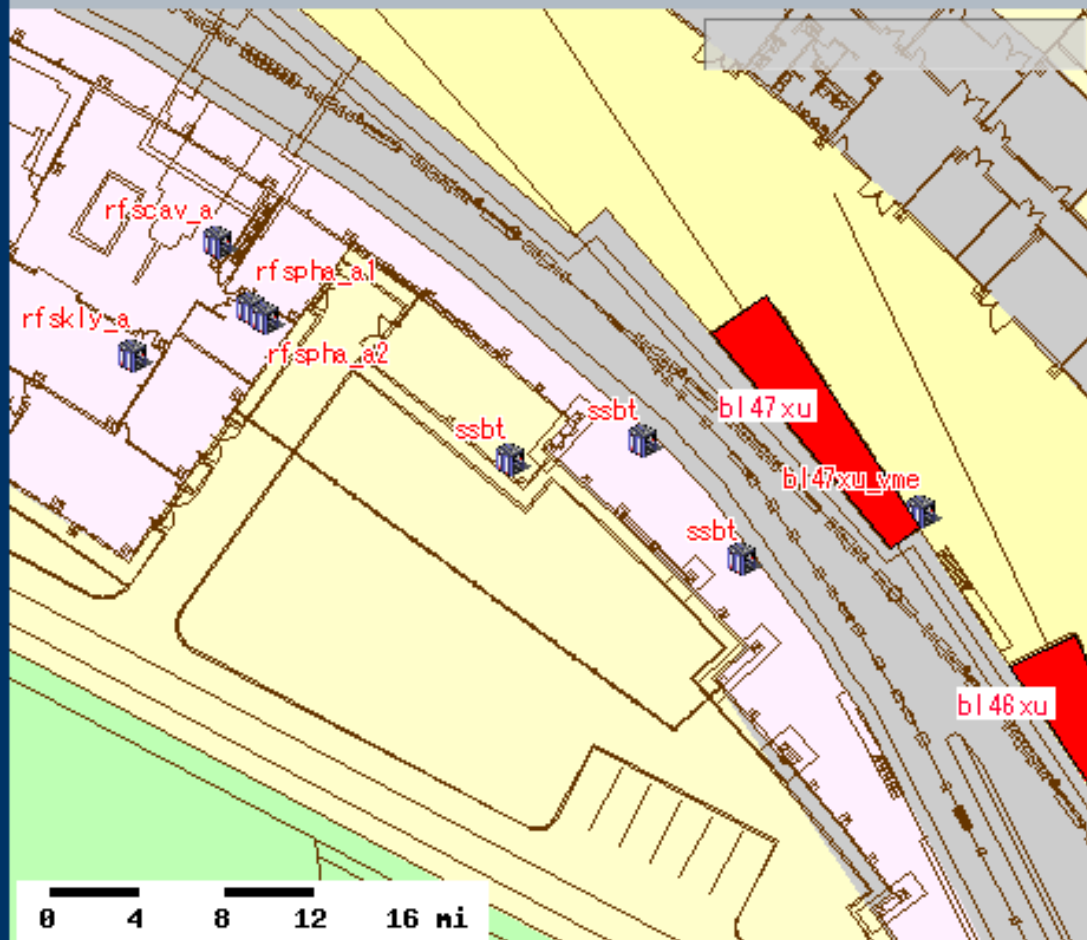
Select zoom in area

0 94 188 282 376 m

p.mapper

Search for

Scale 1: 650428 Zoom ±



p. mapper

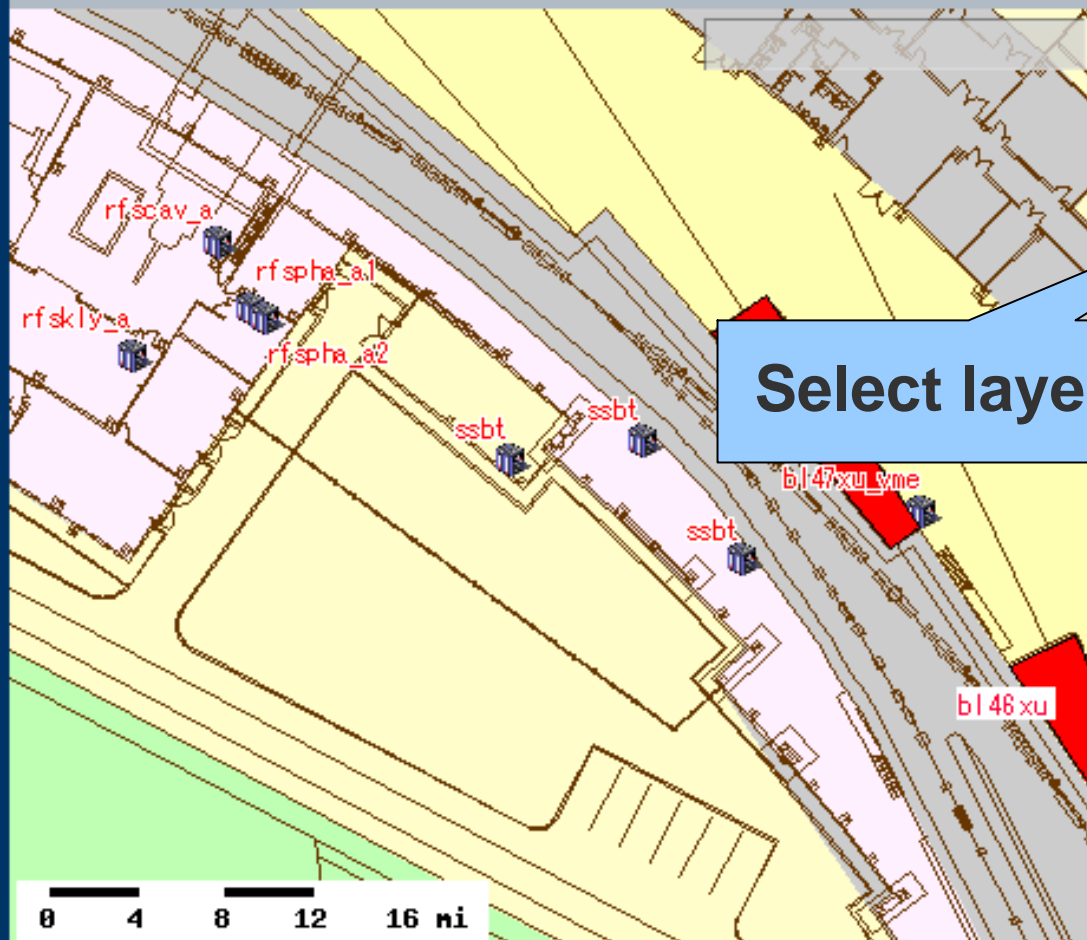


- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - + BL_VME_Backlog

Search for



Scale 1: 650428 Zoom ±



Select layer

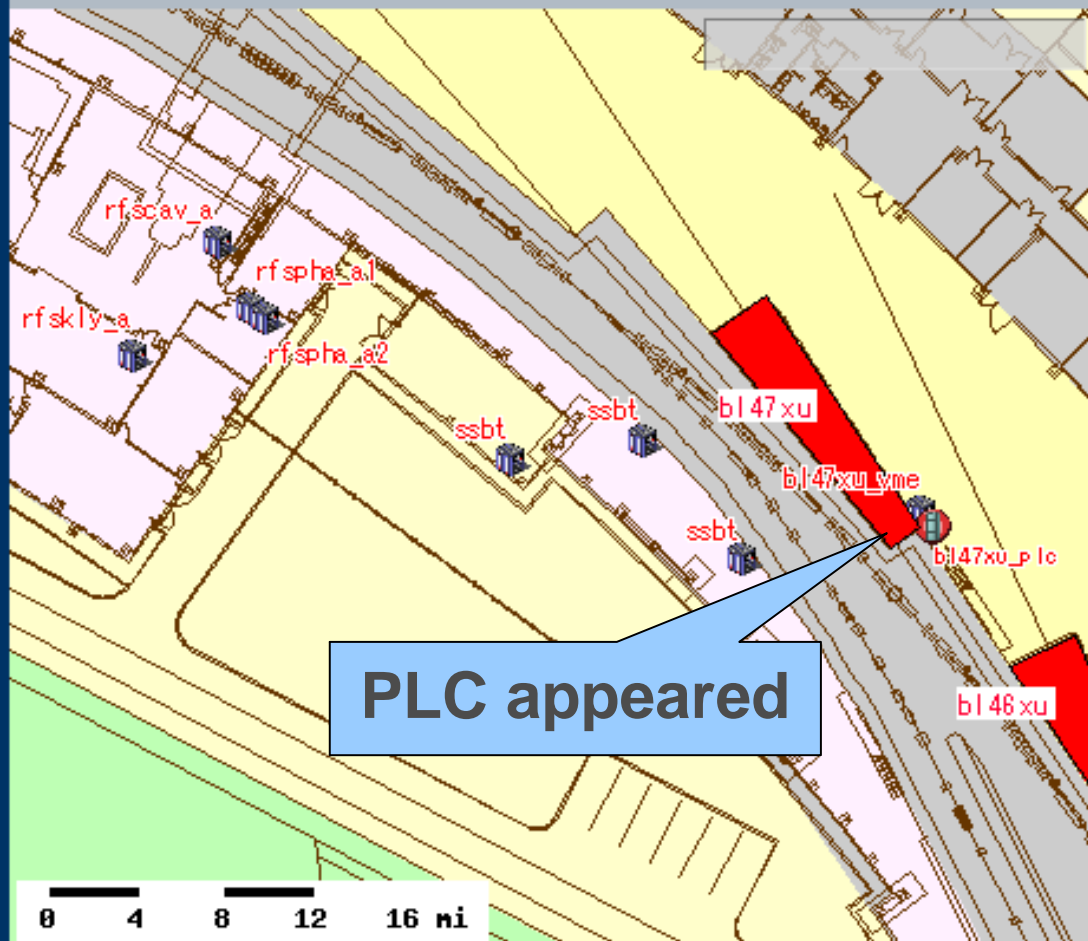
- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - + PL_VME_Recess



Search for

Scale 1: 650428

Zoom ± [Slider]



- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - + BL_VME_Recess



0 4 8 12 16 mi

p.mapper

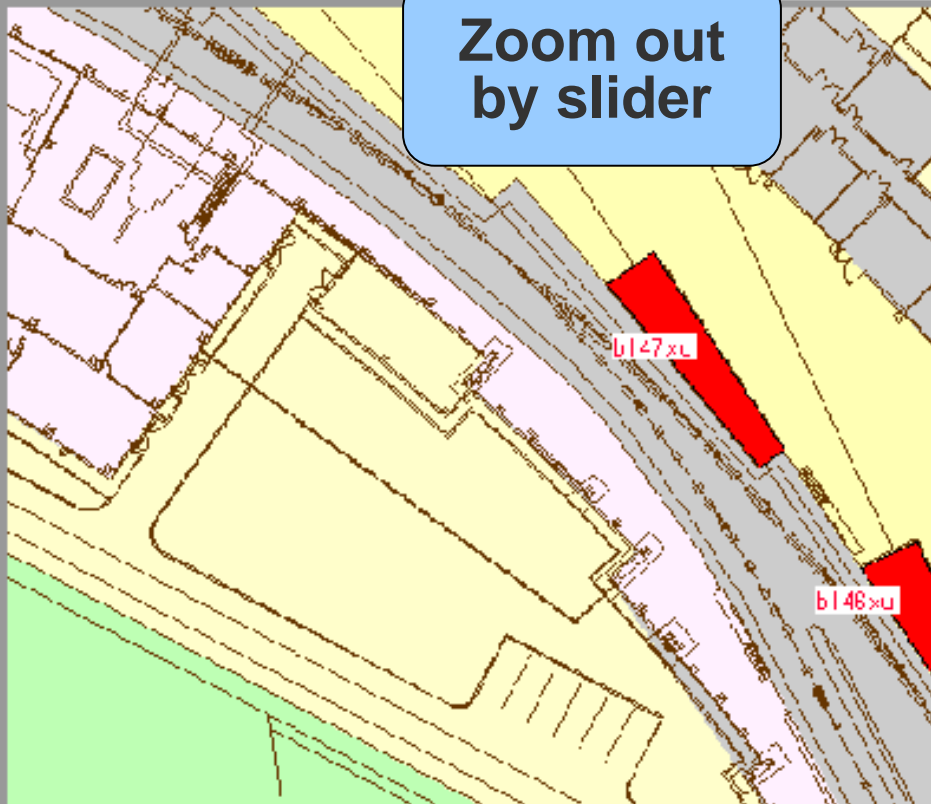
Search for [Dropdown]

Scale 1: 760000

Zoom ± [Slider]

X: 172497 Y: 196494

Zoom out by slider



-
-
-
-
-
-
-
-
-
-
-
-

- [-] vme
 - [+] sr_vme
 - [+] bl_vme
 - [+] id_vme
- [-] plc
 - [+] bl_plc
 - [+] bl_fe
 - [+] bl_plc_exit
 - [+] bl_plc_gp
- [-] other
 - Level
 - satellite
- [-] schedule_2006_SUMMER
 - [+] BL_HARD_mainte
 - [+] PLC_SOFT_mainte
 - [+] BL_VME_Backlog



0 4 8 12 16 mi

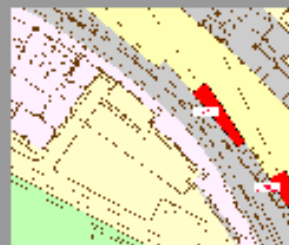
p.mapper

Search for

Scale 1: 2500000

Zoom ±

X: 172497 Y: 196494



- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - + BL_VME_Backlog



0 4 8 12 16 mi

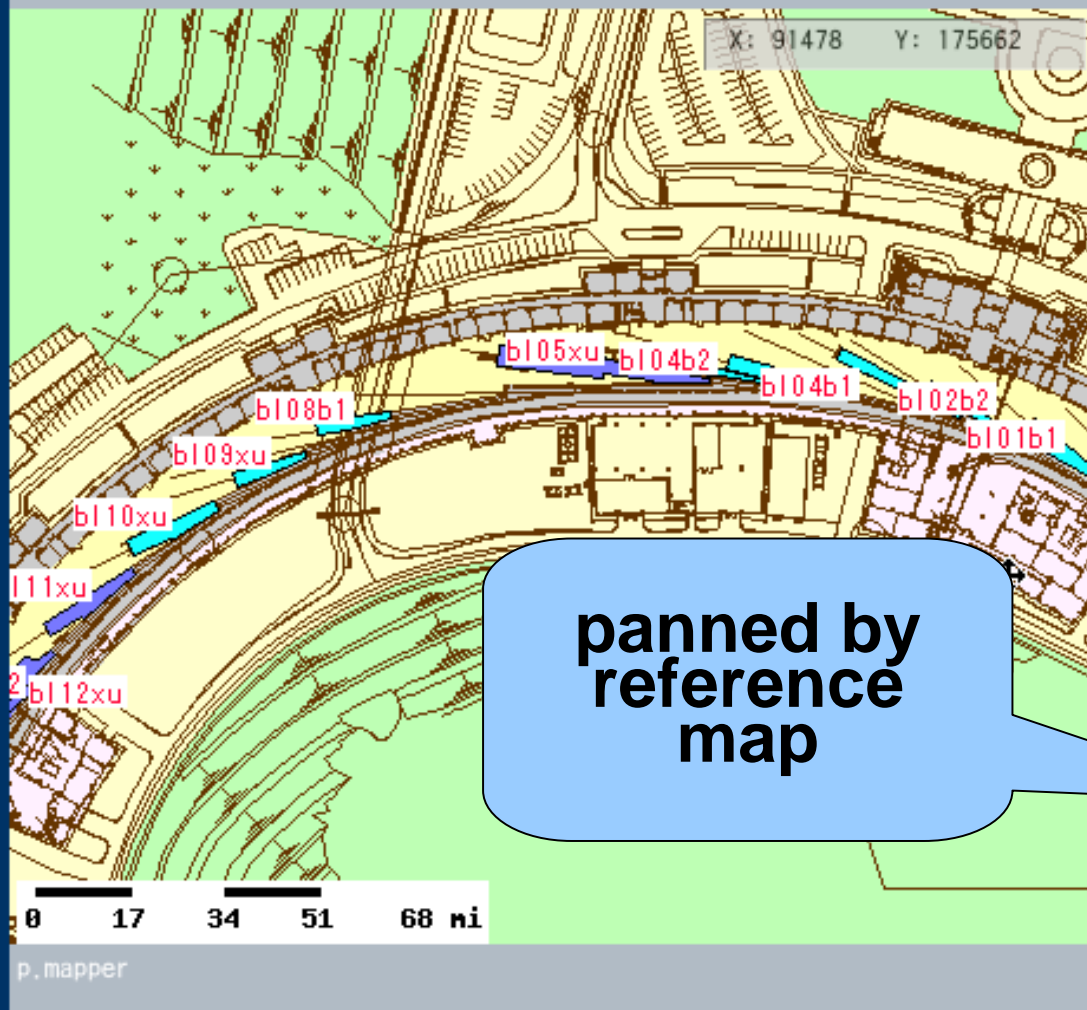
p.mapper

Search for

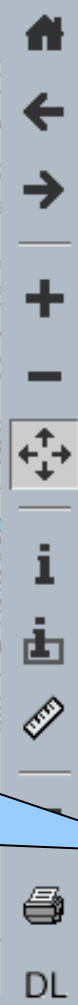
Geo-data source: DCW: geoTorrent



Scale 1: 2600000 Zoom ±



panned by
reference
map

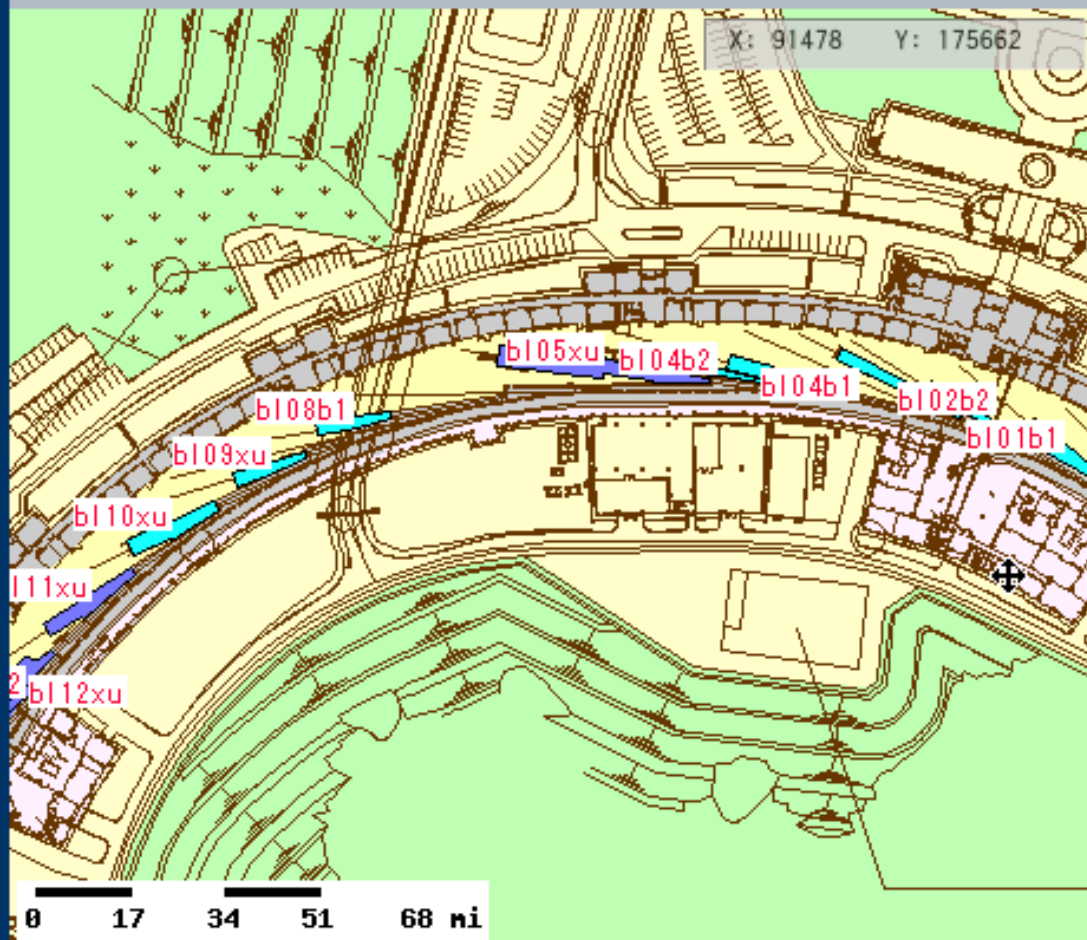


- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - + BL_VME_Backlog



Search for

Scale 1: 2600000 Zoom ±



p. mapper

Navigation and tool icons:

- Home icon
- Previous view icon
- Next view icon
- Zoom in (+) and Zoom out (-) icons
- Full screen (four arrows) icon
- Information (i) icon
- Identify (i) icon
- Print icon
- Refresh icon
- Download (DL) icon

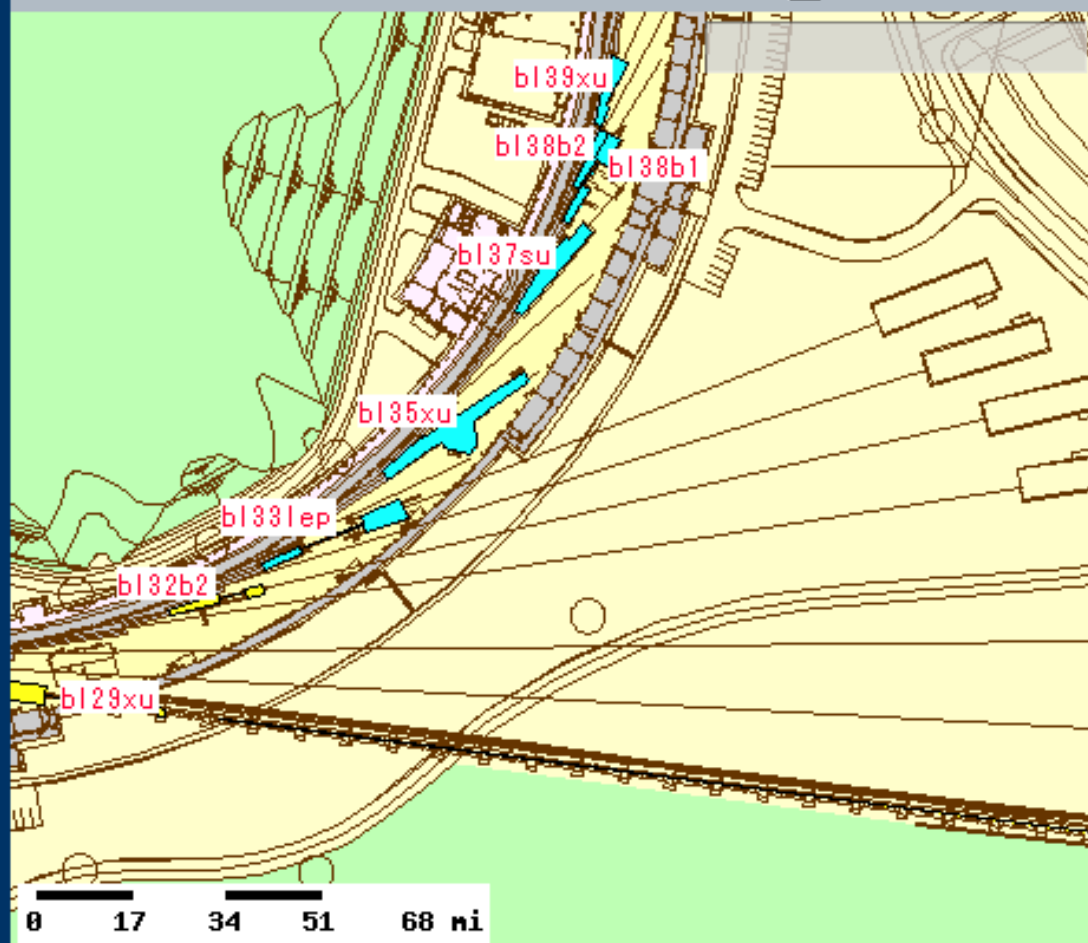
Legend and layer control panel:

- vme
 - sr_vme
 - bl_vme
 - id_vme
- plc
 - bl_plc
 - bl_fe
 - bl_plc_exit
 - bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - BL_HARD_mainte
 - PLC_SOFT_mainte
 - BL_VME_Backlog

Inset map showing the current view's location within a larger geographical context, with a red box highlighting the area shown in the main map.

Search for

Scale 1: 2599999 Zoom ±



- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - + BL_VME_Backlog

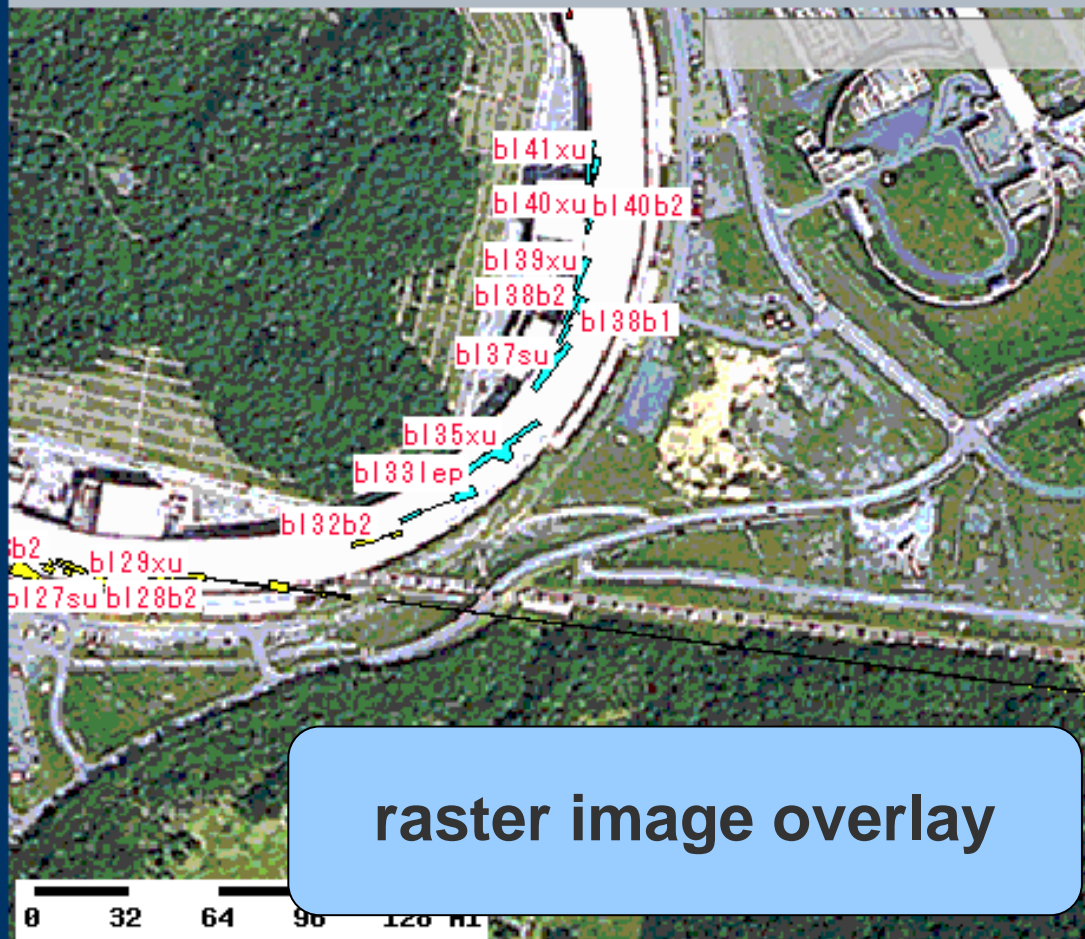


0 17 34 51 68 mi

p. mapper

Search for

Scale 1: 5000000 Zoom ±



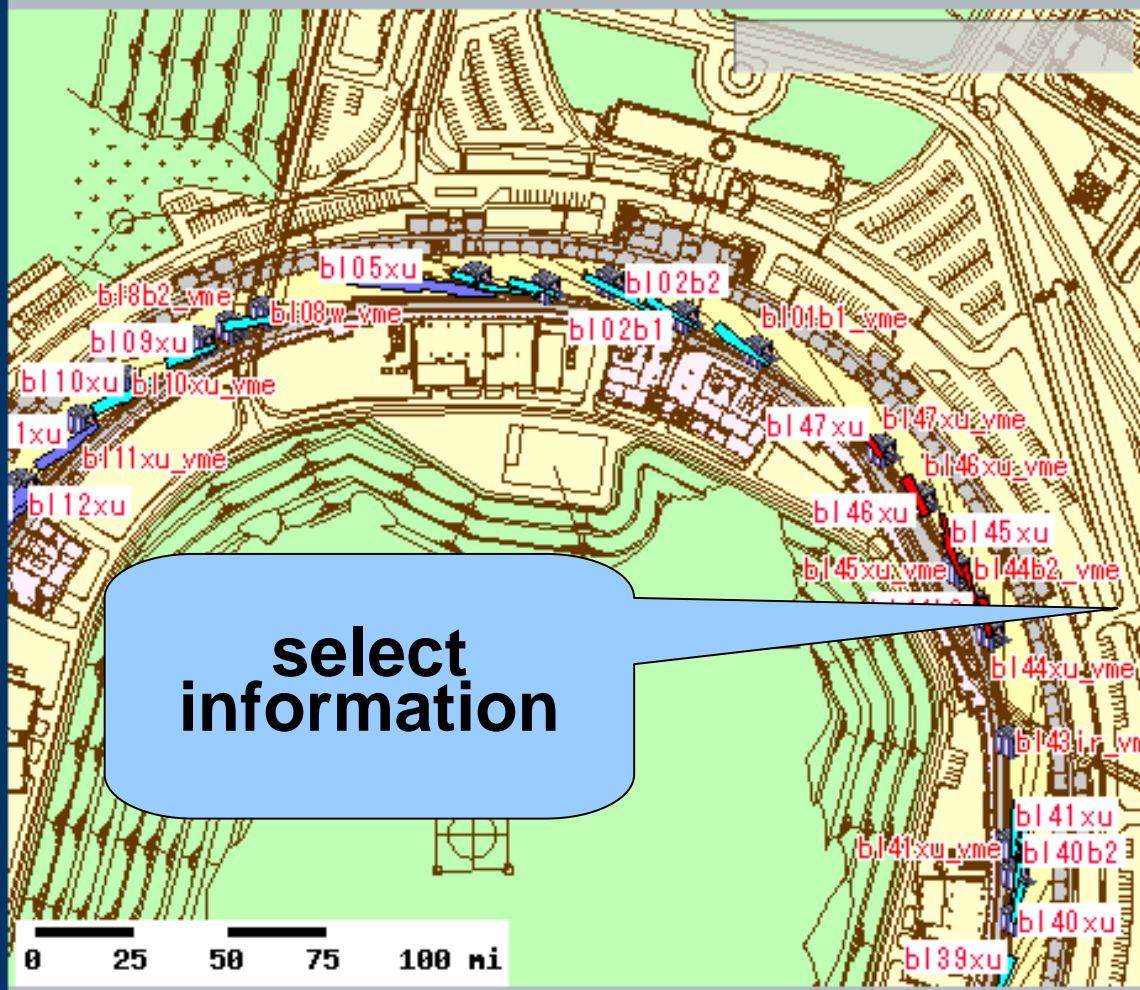
raster image overlay

- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - BL_VME_Dealoss



Search for

Scale 1: 3922422 Zoom ±



- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - BL_VME_Base...

Select



0 25 50 75 100 mi

Selection for Layer BL_HARD_maint

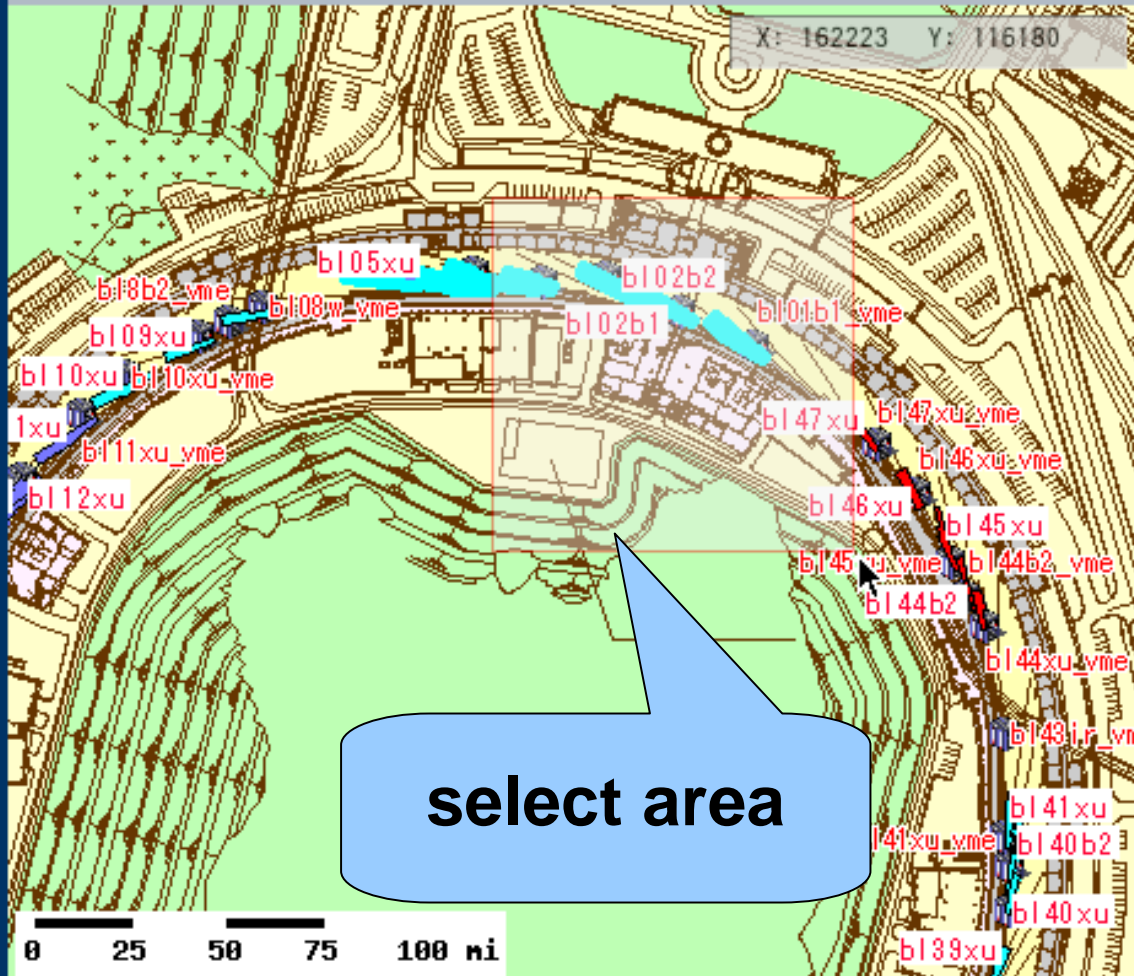
Search for

Coordinate source: DCW: geoTerra



Scale 1: 3922422 Zoom ±

X: 162223 Y: 116180



- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - + BL_VME_Recess



Search for

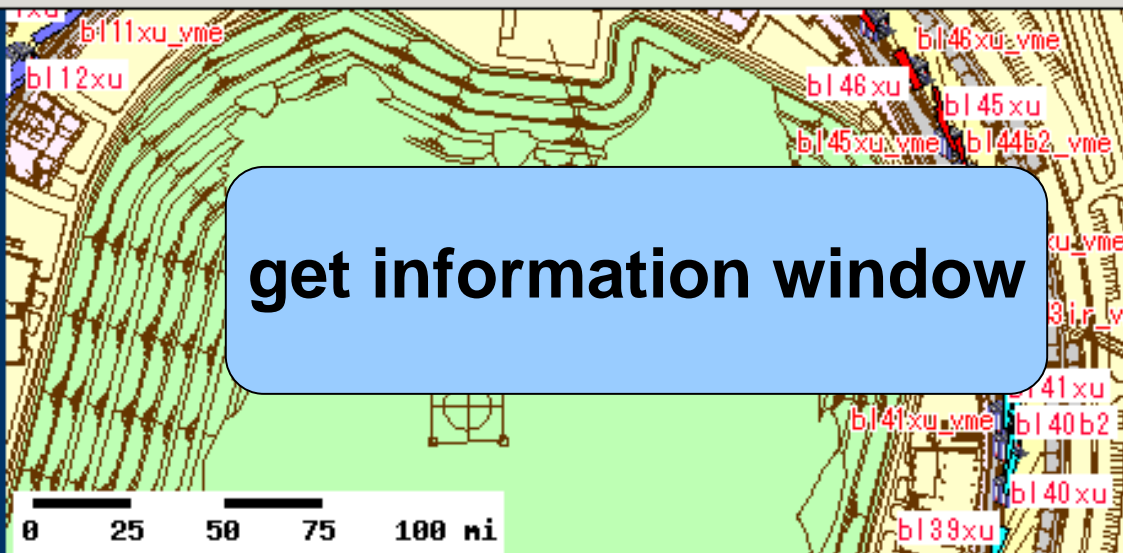
bl_vme

ID	NAME	VME_TYPE	SP8:SERIAL	MFR	SLOT0	SLOT1	SLOT2	SLOT3	SLOT4	S
+	bl01b1_vme	R16	52005107722	Ritta	8001	-	GP1B2	3122	602A	
+	bl02b1_vme	R16		Ritta	8001	-	GP1B2	3122	602A	
+	bl02b2_vme	R16	52005031334	Ritta	8001	-	3122		2005	
+	bl04b1_vme	HS15		HS	8001	-	GP1B2	3122	602A	



Zoom to Selected Features

Done



Selection for Layer bl_vme

Map window size Small

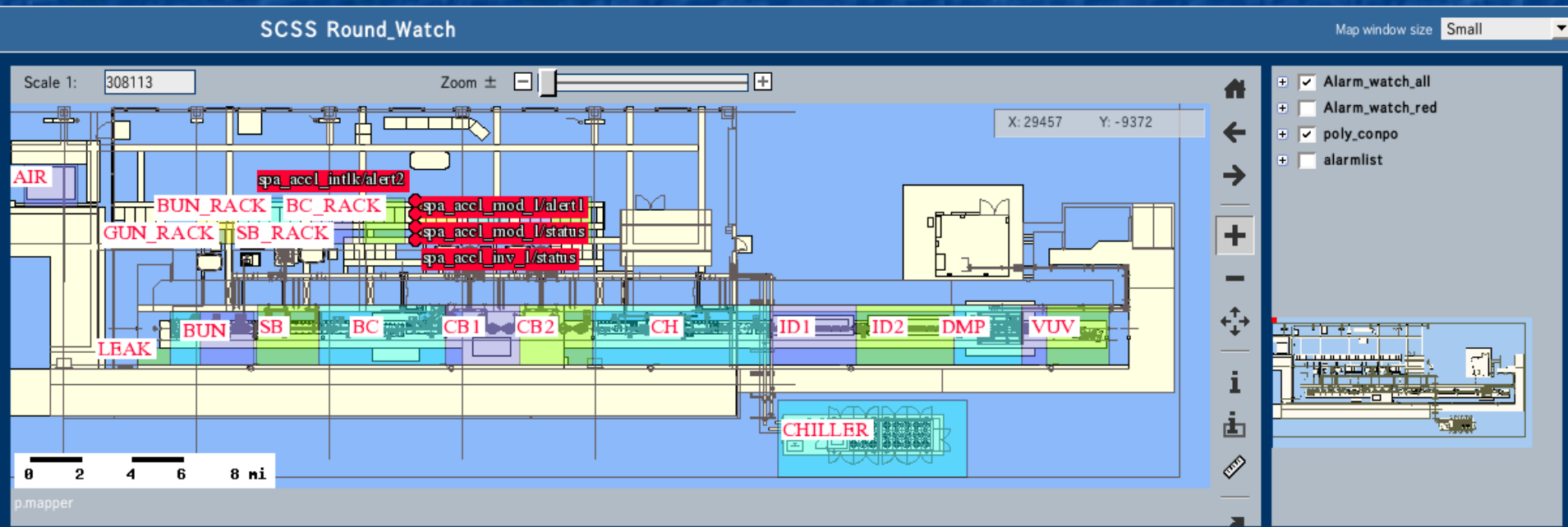
- vme
 - + sr_vme
 - + bl_vme
 - + id_vme
- plc
 - + bl_plc
 - + bl_fe
 - + bl_plc_exit
 - + bl_plc_gp
- other
 - Level
 - satellite
- schedule_2006_SUMMER
 - + BL_HARD_mainte
 - + PLC_SOFT_mainte
 - PL_VME_Boards



Search for

Done

Alarm display for SCSS prototype linac



Alarm display for SCSS prototype linac

SCSS Round_Watch Map window size Medium

Scale 1: 214746 Zoom ±

Heartbeat icon

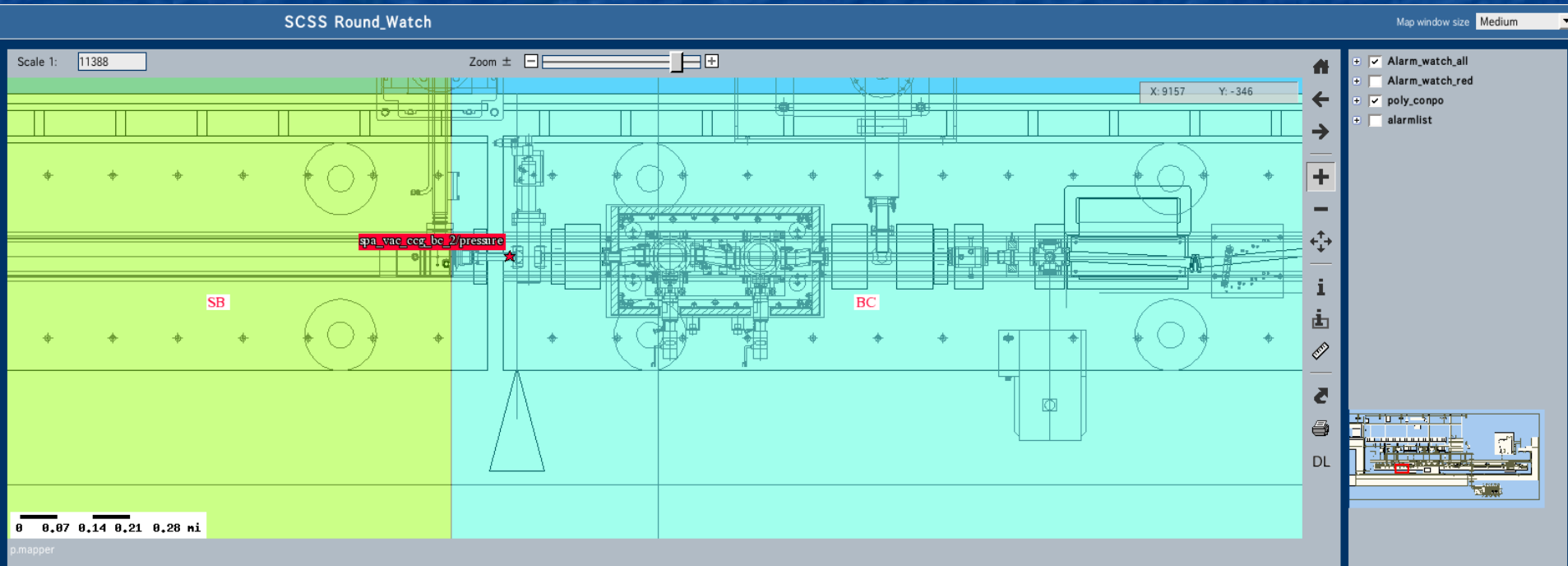
- Alarm_watch_all
- Alarm_watch_red
- poly_conpo
- alarmlist

DL

0 1 2 3 4 ni

o.mapper

Alarm display for SCSS prototype linac



Real time alarm display

Browser requests periodically by ajax.



http server

Application

map server

map file

Alarm database

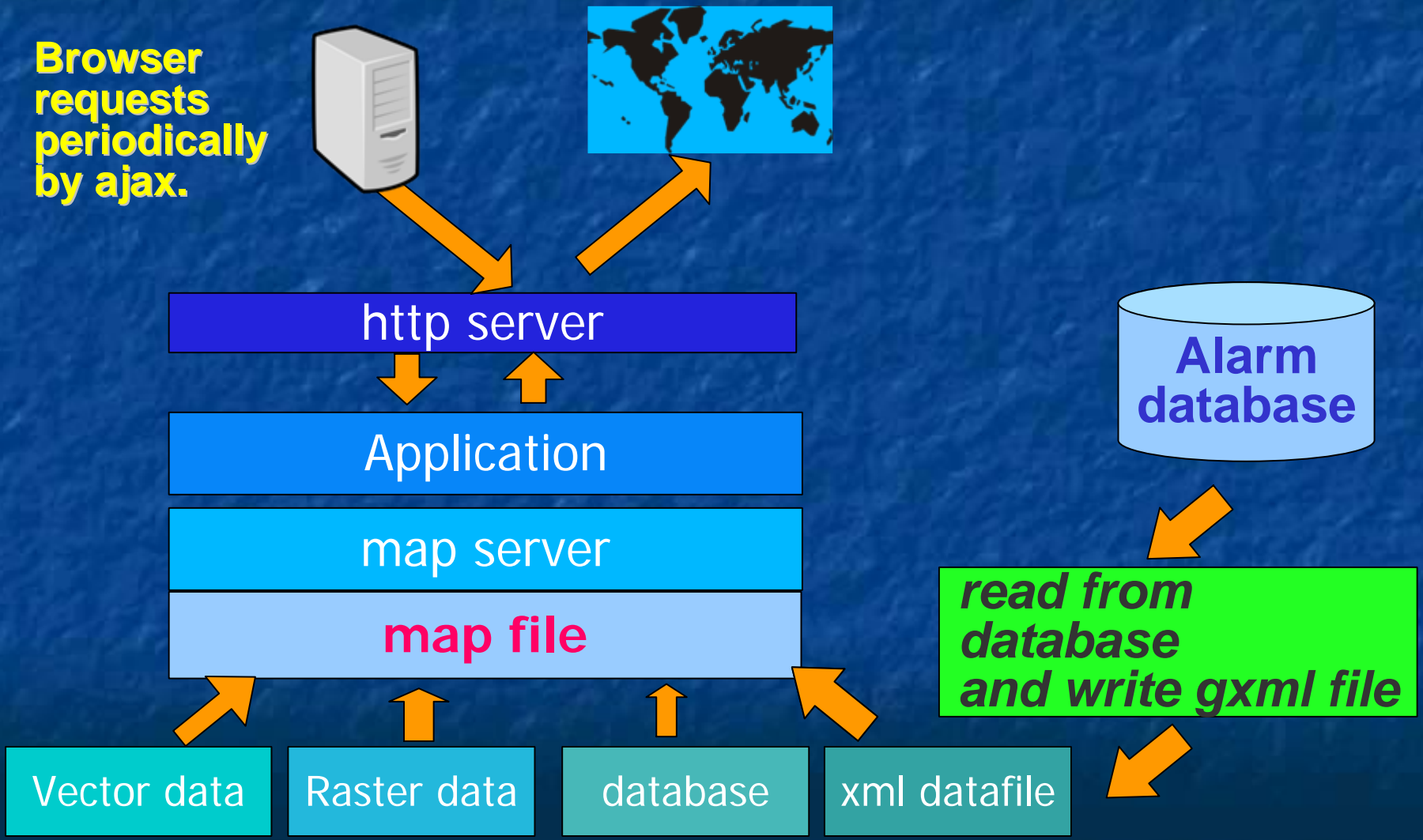
read from database and write gxml file

Vector data

Raster data

database

xml datafile



Development

- About 1 man month to develop equipment management system from zero.
 - Begin with little knowledge on PHP and javascript.
 - Understanding mapfile.
- About 1 week to develop alarm display.
- Little effort to convert Autocad .dxf to shapefile
 - fGIS utility program.
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 - **Consumer Generated Media**
 - Web 2.0 keyword