

Grid and Clouds in Indonesia

Basuki Suhardiman

Institut Teknologi Bandung

ISGC 2011&OGF31, Taipeh



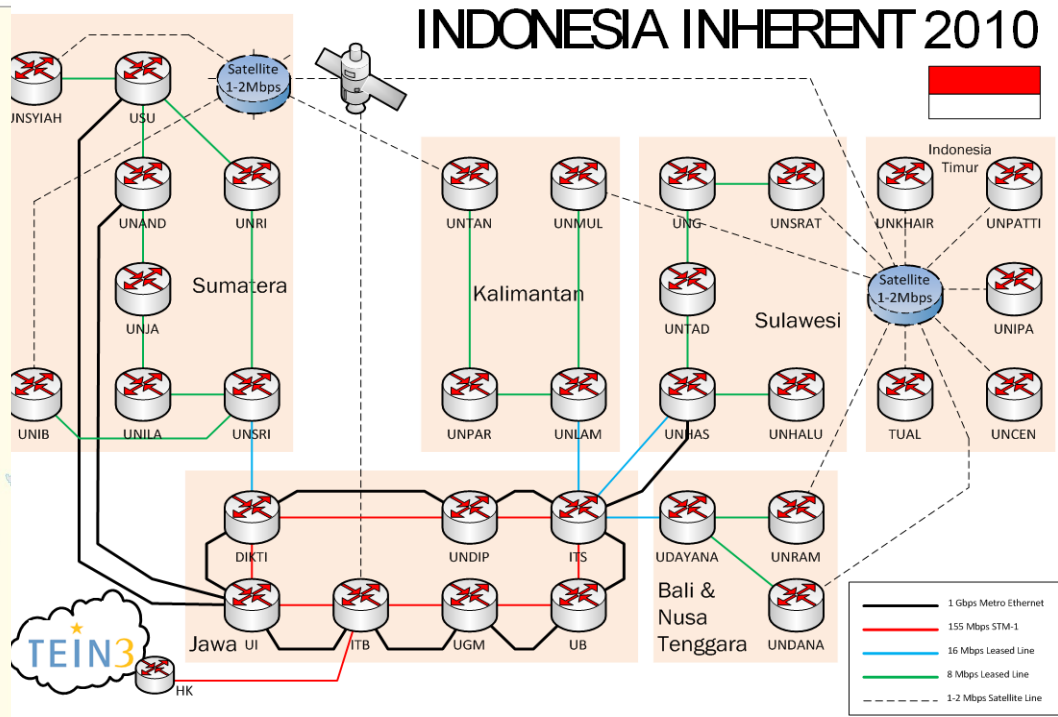
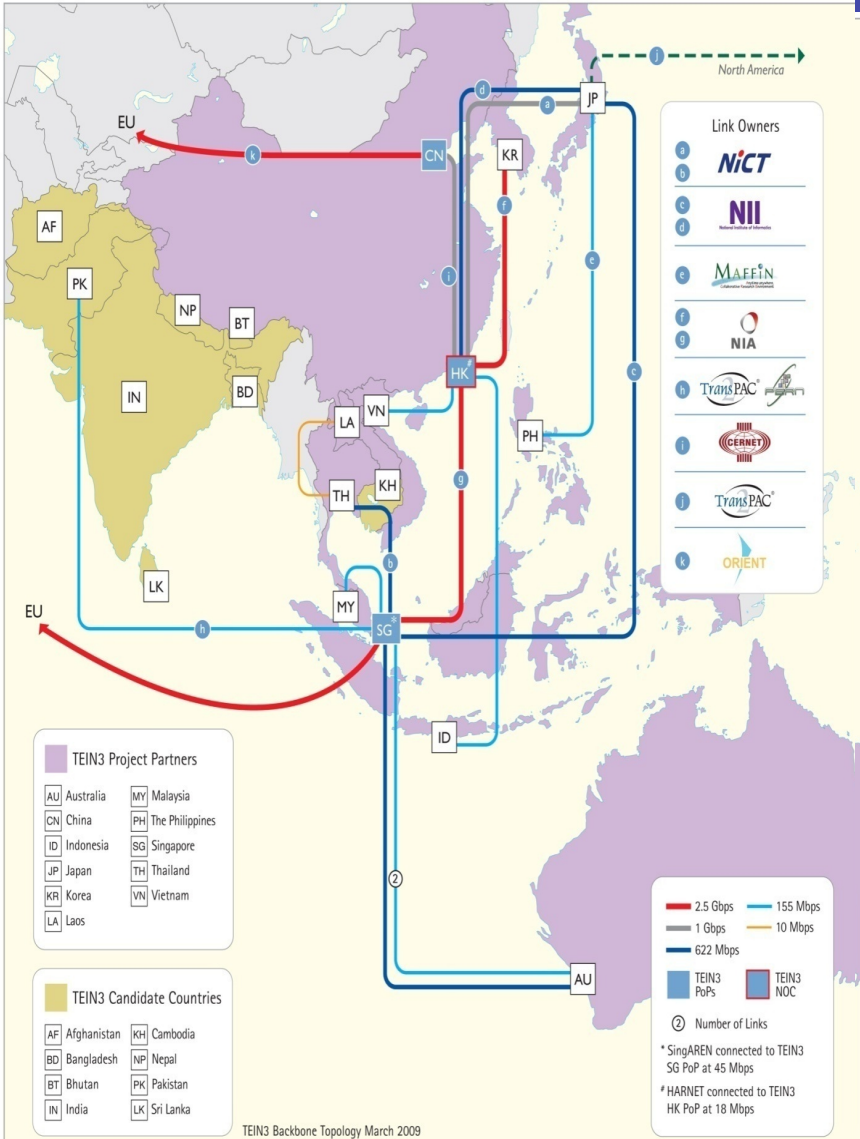
Presentation Outline

- Existing Condition
 - Indonesian Grid (InGrid)
 - ITB Grid Site
- Local Application
 - Weather Forecast
 - Disaster Mitigation
 - Digital Library
- Dissemination Plan

inGrid

- inGrid or Indonesian Grid infrastructure developed by University of Indonesia using UCLA Grid Portal consisting *Globus Toolkit 4* grid middleware and *Gridsphere* grid portlet framework.
- In 2008, there are two clusters connected to inGrid:
 - One production cluster from Faculty of Computer Science, University of Indonesia
 - One research cluster
- Applications available in the research cluster:
 - Povray (3.1g) – gcc
 - mpiBLAST – g77
 - GNU Octave – GROMACS

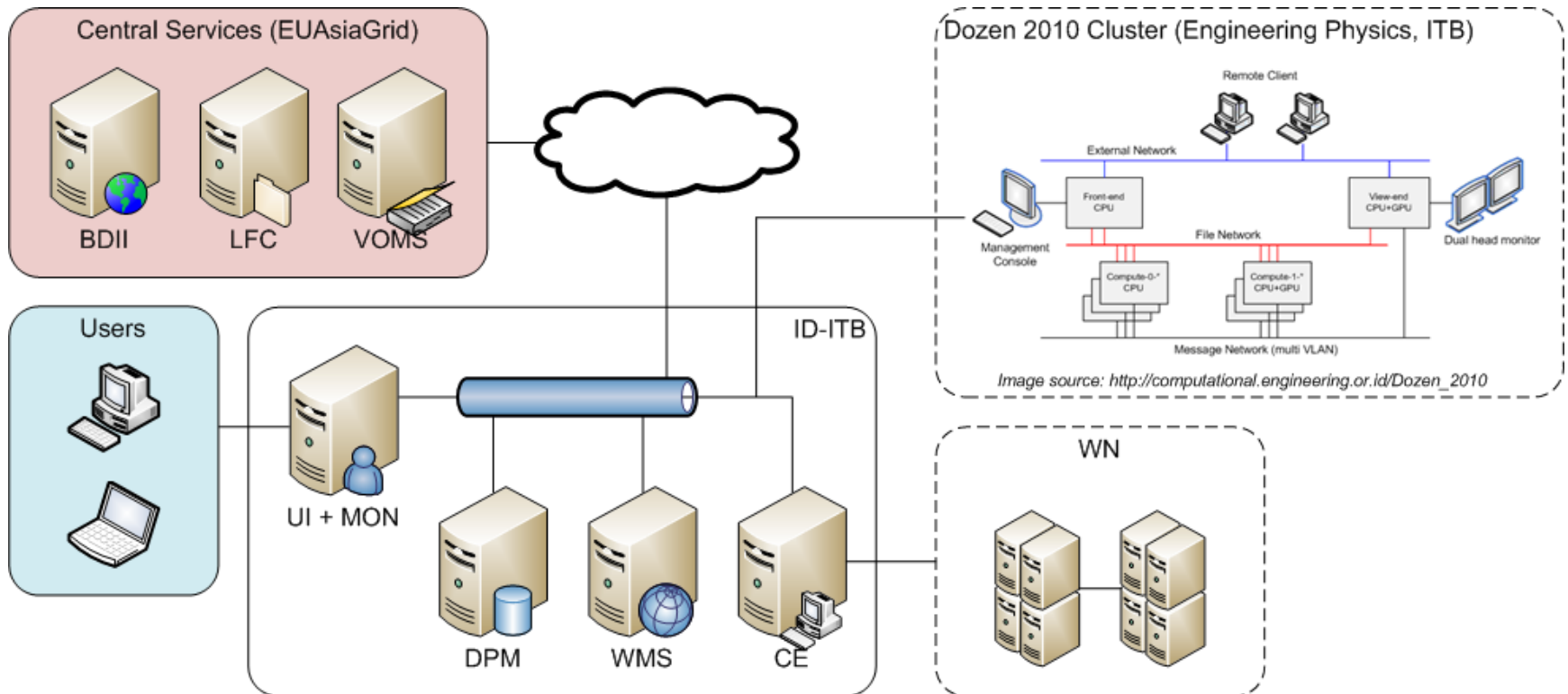
Grid Connected through the Network



ITB Grid Site

- Developed in collaboration with EUAsiaGrid Project
- Last Configuration:
 - User Interface combined with MON-Box, DPM/Storage Element, Computing Element, Workload Management System
 - Able to integrate existing Cluster Computing to ITB Grid Infrastructure (experiment by Computational Engineering Lab. in Engineering Physics Dept.)
- The Last Site Configuration was not Perform
- Redesign the Whole ID-ITB Site
 - Starting with CE & WNs

ID-ITB Site



Local Application

- Weather Forecast
 - WRF4G
 - GPU Cluster
- Disaster Mitigation
 - Hazard Map
 - Firewatch
 - Volcanoes (Future Plan)
- Chemistry / Bio-Informatics
- Digital Library (Future Plan)

Weather Forecast^(1/4)

- This Experimental application is using MODIS data from satellite image¹ to generate weather forecast information and displayed in a web page.
- Parameters used for this Infrared and Water vapor TBB (Temperature Blackbody Maritime Continent.

WCPL Experimental Weather Forecast

Home Monitoring v Global v Regional v Java Island v Cities v

WCPL - Weather Forecast Table

Region: West Java (including Jakarta and Banten)

Valid: 14-02-2010 1600 WIT to 14-02-2010 1900 WIT

| City | Temp (°C) | | RH (%) | | wspd (m/s) | | wdir | | ICLW (mm) | | RC (mm) |
|-------------|-----------|------|--------|------|------------|------|------|------|-----------|------|---------|
| | 1600 | 1900 | 1600 | 1900 | 1600 | 1900 | 1600 | 1900 | 1600 | 1900 | |
| Jakarta | 25 | 24 | 79 | 82 | 4 | 4 | SW | SSW | 5 | 4 | 39 |
| Serang | 25 | 24 | 75 | 72 | 7 | 7 | WNW | W | 5 | 0 | 0 |
| Bogor | 23 | 23 | 81 | 77 | 5 | 5 | SSW | SSW | 4 | 2 | 3 |
| Cianjur | 21 | 21 | 95 | 87 | 2 | 2 | N | SE | 2 | 3 | 0 |
| Cimahi | 20 | 19 | 91 | 91 | 8 | 5 | WNW | WNW | 1 | 2 | 0 |
| Bandung | 20 | 19 | 89 | 91 | 8 | 6 | WNW | W | 2 | 3 | 0 |
| Sukabumi | 20 | 20 | 89 | 84 | 10 | 10 | NNW | NNW | 5 | 2 | 0 |
| Cirebon | 25 | 24 | 89 | 94 | 9 | 6 | WSW | W | 7 | 10 | 1 |
| Pangandaran | 25 | 24 | 94 | 98 | 7 | 2 | SSE | WSW | 11 | 16 | 64 |

*Issued Sat Feb 13 02:35:30 WIT 2010

Date and Region Setting

choose date: 201002131900 choose region: West Java Others Submit

WCPL - Contribution 2006
XHTML: CSS: RSS: Credit

Weather Forecast (2/4)

- GRID utilization to support Numerical Weather Prediction (NWP) research activity which is concerned with the development of a common regional platform for NWP application in Southeast Asia.
- NWP experiment performed by implementing WRF4G (WRF for Grid) developed by University of Cantabria under EELA2 to find the most suitable downscaling strategy for NWP in South East Asia.

Weather Forecast (3/4)

Grid Enabled and Improved Weather Forecast

■ Case Studies:

- Current application used for weather forecast running on 8-nodes Cluster with OpenSuse 10.3 as the Operating System.

■ Obstacles:

- Dependency and library issues, especially conflicting library versions and Compiler

■ Current Activity:

- Testing the Weather Forecast application on GPU Cluster

Weather Forecast (4/4)

- Develop two GPU Cluster
 - Dual Intel® 5500/5600 series Xeon® Quad/Dual-Core, with QPI up to 6.4 GT/S
 - 1 NVIDIA M2050 GPU Card Enterprise Level 4x 448 CUDA Cores
- Install
 - WRF
 - CAM (climate model) for tropical country (Indonesia)
- Result
 - WRF (not optimized , still investigate and develop solution)
 - CAM
- Obstacle
 - MPI (GPU)
 - Compiler (GPU)

Mitigation of Natural Disaster

- The focus area of the Disaster mitigation are Hazard map for the mitigation and the vulnerabilities.
 - The Hazard map focus on the seismic hazard map, earthquake hazard map, and information hazard map for the mitigation (peoples).
 - The vulnerabilities focus on the risk impact factors and risk area for infrastructure such as road, electricity, water and other impact to the peoples.
- The development of this domain need for digitization, modeling and visualization in data processing that demands Grid-enabled high performance computing

- Hazard Map Development



- Firewatch (1/3)

- Collaboration between Government of Indonesia and Australia
- Among many institution in Indonesia
 - Ministry of Forestry
 - Ministry of Environment
 - Ministry of Education (Higher Education/Inherent)
 - LAPAN
- Objective:
 - Automatic real-time satellite processing
 - High speed access to satellite image products
 - Hardware, software and communication Installation
 - Imagery for Forest Cover Mapping
- Support the network Infrastructure
 - Deliver data from Australia to Indonesia Via TEIN3 Network (155 Mbps)
 - Deliver data via Inherent Network
 - Connected Inherent Network to MoF, MoE ,LAPAN

- Firewatch (2/3)

IndoFire - Map Service - Windows Internet Explorer

http://indofire.landgate.wa.gov.au/indofire.asp

File Edit View Favorites Tools Help

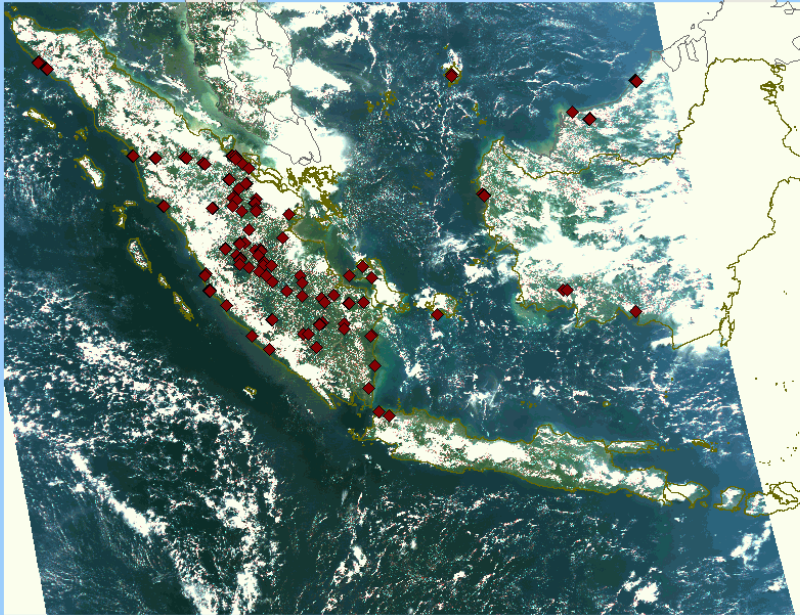
Microsoft Outlook... eHR Web Kiosk SRSS Landgate In... SRSS Landgate In... Landgate IndoFire - Map... Page Tools

GMT / UTC | WIB | WITA | WIT

INDOFIRE

ZOOM TO POINT
Lat: -0.955 Long: 102.175 90

CURSOR LAT./LONG.
6.537, 112.725



Refresh Map

Current Fire Information

MODIS Hotspots - Daily

28 April 2009 to 28 April 2009 List

Toggle checkboxes
 Turn images off

28/4/2009 19:00 GMT - Aqua from Goddard SFC
View
Hotspots Imagery 20
Download Not available Imagery select

28/4/2009 17:20 GMT - Aqua from Goddard SFC
View
Hotspots Imagery 20
Download Not available Imagery select

28/4/2009 15:55 GMT - Terra from Goddard SFC
View
Hotspots Imagery 20
Download Not available Imagery select

28/4/2009 14:20 GMT - Terra from Goddard SFC
View
Hotspots Imagery 20
Download Not available Imagery select

28/4/2009 06:35 GMT - Aqua from Goddard SFC
View
Hotspots Imagery 143
Download Hotspots Imagery select

Internet 100%

- Firewatch (3/3)

■ Future Plan

■ Objectives

- To process more specific location
- To reduce time processing close to 12 hour to every hour

■ Porting stand alone application to grid enable

■ Utilize Grid to improve the performance (time processing)

■ Overlay with other data

- Weather prediction (wind direction, wind speed)

- Volcanoes (Future Plan) (1/2)

■ Objective

- Add Volcanoes related information and database to have a thorough database thus can be used to produce a comprehensive Hazard Map.
- Develop the data integration
 - Seismic on volcanoes
 - Sensors on Volcanoes

- Volcanoes (Future Plan) _(2/2)

Parabola for Database IIR v1.0

File | Connect | Exit | Informasi | Pengempusan

Status HP

No. Ser: 0123456789101234

Sinyal:

Connect

HP Ingres

Delete

Hapus

Data Ingres

Database TLR

Database Gempa

No. HP Kiri

No. HP Terima

Semua

Semua List

Plot Grafik

Aksi: 02/16/2010

Aksi: 02/16/2010

Plot Grafik

Status: Serial port is open. Settings: 115200 n,8,1

Data Ingres

| Tanggal | Nama | Nil | Status |
|----------------------|--------------------|-----|--------|
| 1/20/2010 4:02:25 PM | TLR CMD CPU.S-3000 | | F |
| 1/20/2010 4:02:40 PM | TLR CMD CPU.S-3000 | | F |
| 1/20/2010 4:03:50 PM | TLR CMD CPU.S-3000 | | F |
| 1/20/2010 4:03:16 PM | TLR CMD CPU.S-3000 | | F |
| 1/20/2010 4:05:40 PM | TLR CMD CPU.S-3000 | | F |
| 1/20/2010 4:06:16 PM | TLR CMD CPU.S-3000 | | F |
| 1/20/2010 4:12:19 PM | TLR CMD CPU.S-3000 | | F |

Database TLR

| Tanggal | Jam | Kode | Ch1 | Ch2 | Ch3 | Ch4 | Ch5 | Ch6 | Ch7 | Ch8 | Ch9 | Status |
|------------|----------|------------|-----|-------|------|--------|-----|-----|-----|--------|-------|--------|
| 2009/10/16 | 14:25:14 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/16 | 15:40:13 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/16 | 16:40:13 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/16 | 17:40:13 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/16 | 18:45:12 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/16 | 19:45:12 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/16 | 20:50:11 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/16 | 21:50:11 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/16 | 22:58:10 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/17 | 00:00:08 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/17 | 02:00:08 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/17 | 04:00:08 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/17 | 06:10:07 | TLR0101020 | 0.1 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/17 | 08:10:08 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/17 | 09:20:06 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |
| 2009/10/17 | 08:26:05 | TLR0101020 | 0.0 | +4095 | 5.26 | 409.50 | 0 | 0 | 0 | 409.50 | 16.36 | B |

Database Pengempusan

| Tgl Awal | Jam Awal | Tgl Akhir | Jam Akhir | Kode/Gerakan | GGH | IMP | VA | VB | TLK | TLF | LP | AP | INS | EST | ITS | TNL | Max | Min | GTS | |
|------------|------------|------------|------------|--------------|-----|-----|----|----|-----|-----|----|----|-----|-----|-----|-----|-----|-----|-----|---|
| 10/11/2008 | 7:50:00 AM | 10/11/2008 | 7:50:00 AM | GERANG | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10/12/2008 | 7:49:00 AM | 10/12/2008 | 7:42:00 AM | GERANG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10/14/2008 | 7:42:00 AM | 10/15/2008 | 7:56:00 AM | GERANG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10/15/2008 | 7:52:00 AM | 10/16/2008 | 7:22:00 AM | GERANG | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10/16/2008 | 7:34:00 AM | 10/17/2008 | 7:13:00 AM | GERANG | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10/17/2008 | 7:14:00 AM | 10/18/2008 | 7:49:00 AM | GERANG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10/18/2008 | 7:44:00 AM | 10/19/2008 | 7:21:00 AM | GERANG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10/19/2008 | 7:23:00 AM | 10/20/2008 | 7:17:00 AM | GERANG | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10/20/2008 | 7:19:00 AM | 10/21/2008 | 7:06:00 AM | GERANG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

Daftar Stasiun

| Kode TLR | Kode Stasiun | Kode Gerak | Nama | Alamat |
|------------|--------------|------------|-------------------|------------------------------------|
| GERANG | GERANG | GERANG | ST. GEMPA (DIENG) | POS. PENGAMATAN, PEGUNUNGAN, DIENG |
| TLR0101020 | CO2, DIENG | GERANG | ST. CO2, DIENG | POS. PENGAMATAN, PEGUNUNGAN, DIENG |
| TLR0101120 | SUHUSALERI | DIENG | ST. SUHUSALERI | KAWAHWEILERI |

SISTEM PENGIRIMAN DATA DIGITAL TLR
Stasiun Monitoring Gas CO₂
Pegunungan Dieng

Berikut adalah gambaran umum dari sistem ini: Sistem pengirim data digital ini dirancang untuk memantau status stasiun pemantauan gas CO₂ di Pegunungan Dieng. Sistem ini terdiri dari beberapa bagian, yaitu: Stasiun pemantauan gas CO₂, Stasiun pengirim data digital, dan Stasiun penerima data digital. Sistem ini akan mengirimkan data digital ke stasiun penerima data digital yang terhubung ke sistem monitoring.

PETA LOKASI STASION GAS CO2 GUNUNG DIENG JAWA TENGAH

The map displays the Dieng Plateau region in Central Java, Indonesia, with a red dot indicating the location of the CO2 station. The map includes a scale bar (0 to 20 km) and a north arrow. A legend identifies the station location and the Dieng Plateau boundary.

REKAM JEJAK

- Stasiun Pemantauan Gas CO₂
- Stasiun Pengirim Data Digital
- Stasiun Penerima Data Digital
- Pos. Gunung Dieng

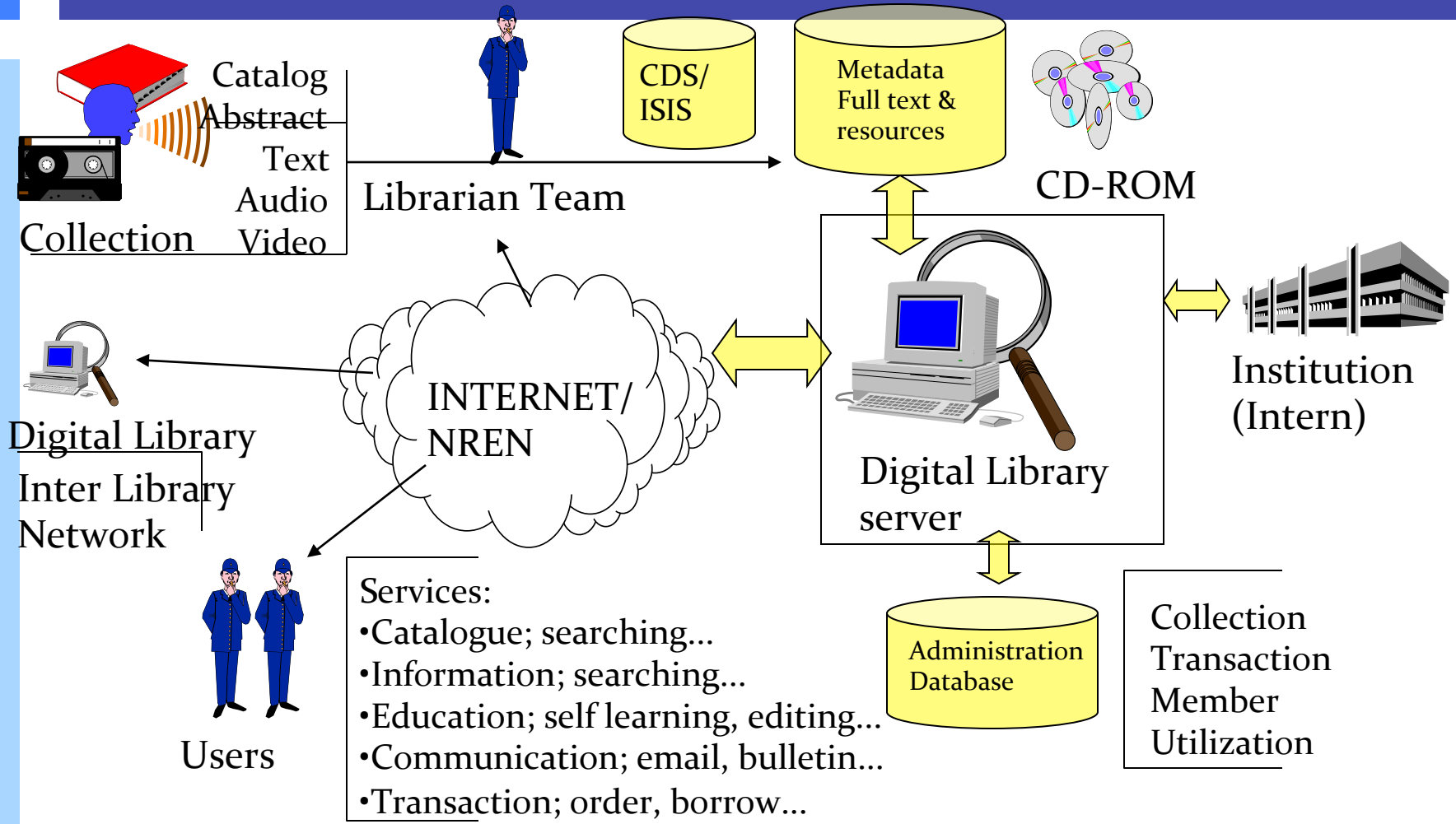
REKAM JEJAK

Rekam jejak sistem ini meliputi: 1. Sistem pengirim data digital yang mampu mengirimkan data digital ke stasiun penerima data digital. 2. Sistem penerima data digital yang mampu menerima data digital dari stasiun pemantauan gas CO₂. 3. Sistem monitoring yang mampu memantau status stasiun pemantauan gas CO₂ dan mengirimkan data digital ke stasiun penerima data digital.

Digital Library – Background (1/5)

- Digital Library is a management system for library resources (teks, audio, video) in digital format.
- More than 50 universities network running on the
- Generally provide online access:
 - Internet
 - NREN
- Utilizing Inherent Network to Build Indonesia Digital Library Network (Indonesia DLN) with other Universities in Indonesia

Digital Library System (2/5)



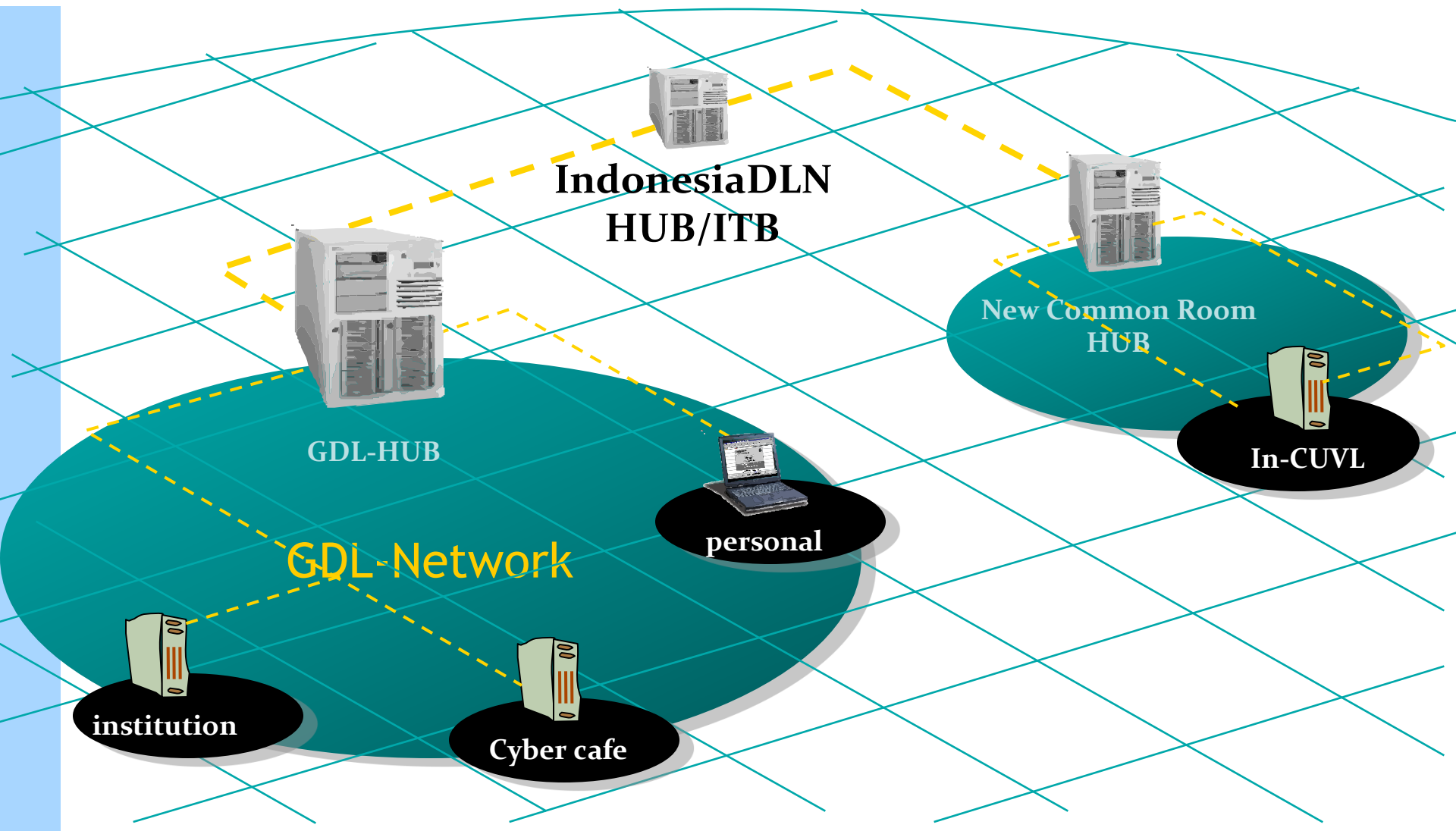
Digital Library – Indonesia DLN

(3/5)

- Develop software which dedicated to ITB's central library (Ganesha Digital Library/GDL 3.0) = **End of 1999**.
- Initiative the meeting which followed by ITB's central library partner in developing IndonesiaDLN= **October 2000**.
- Launched of GDL 3.1 and formed the IndonesiaDLN = **June 2001**. GDL 3.1 became "engine" for ITB's central library partner who join with IndonesiaDLN
- Launched of GDL 4.0 (Network of Networks/NeoNs concept) = **End of 2003**
- Develop and launch Inherent GDL 4.2 (Inherent K1) **2006**
- Start to develop GDL for Grid enable (2011)

Digital Library — GDL Network Architecture

(4/5)

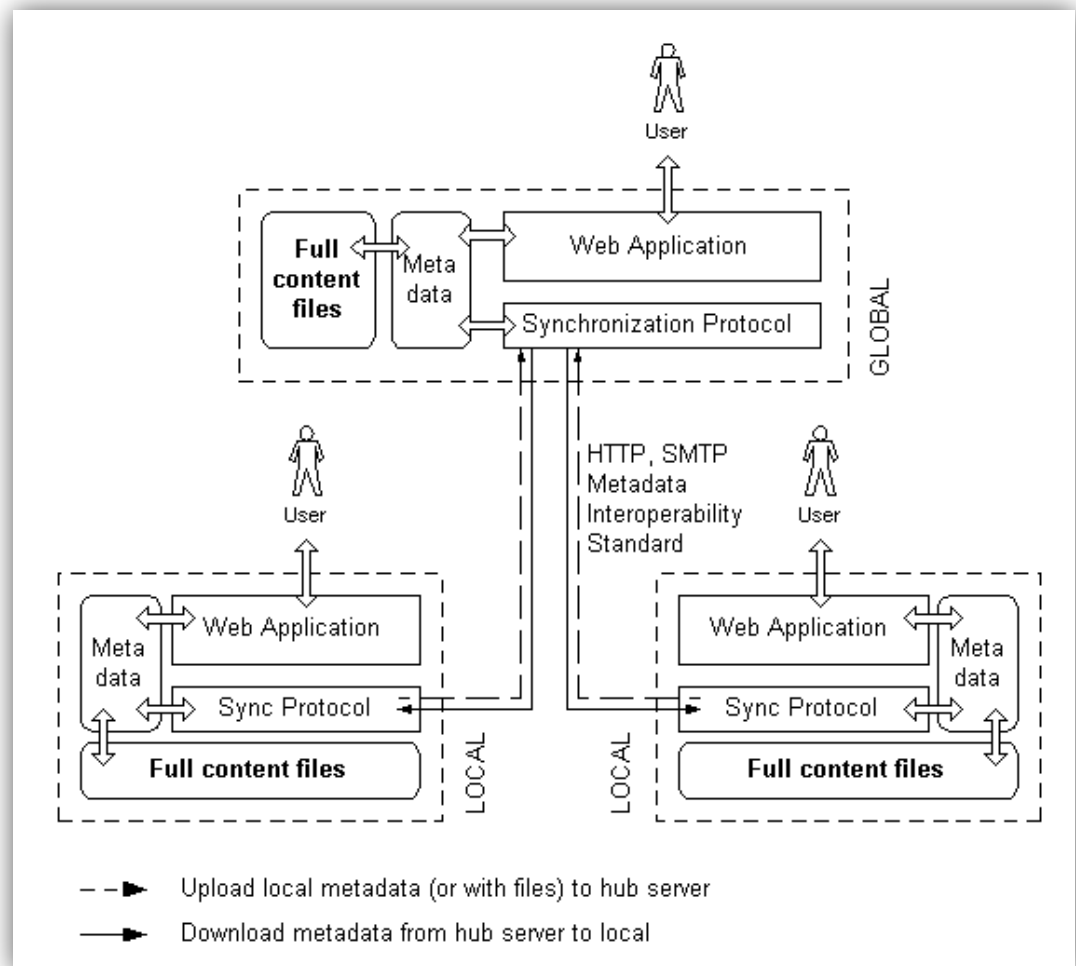


Digital Library — GDL Network Architecture (4/5)

Key:

- Standard Metadata
- Protocol

There are a hub and many digital library servers.



*GDL = Ganesha Digital Library

Digital Library – Future Plan (5/5)

■ Future Plan

- Port GDL Application to Grid enable
- Grid can be utilized, for example, for indexing process, and storage

Dissemination Plan

- Objective:
 - Extend Grid Technology to other university
 - More people aware of Grid Infrastructure and Grid Applications, and able to access Grid Resources Available
 - More people interested and join the development of Grid and Grid Application
- Dissemination Activity Planned
 - Development on grid technology
 - Conference
 - Training

Thank You