

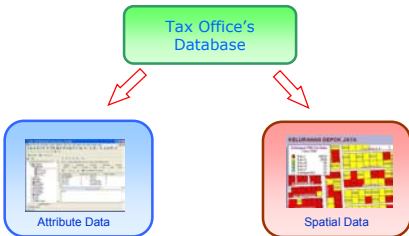
Improvement of Tax Office's Spatial Data Security through Spatial Database Redesign

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Presentation Subjects

- 1 Background
- 2 Data Security Theory
- 3 Existing System Analysis and Security Policy
- 4 Design & Implementation
- 5 Analysis
- 6 Conclusions & Suggestions

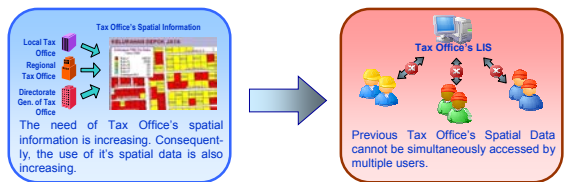
1 Tax Office's LIS in Indonesia



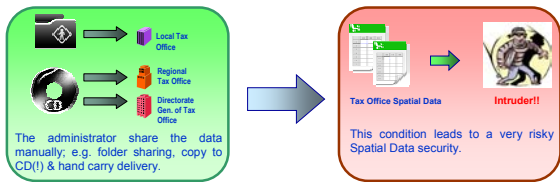
Facts:

- Collects >80 millions of Parcels, still increasing
- Tax contribute > 78% of State Revenue
- Attribute Data: secured
- Spatial Data: Visualization: ??

1 Background



1 Background



Question

- How is the existing spatial database security condition?



2 Concept of Data Security

Aspects of Data Security (Bishop, M.)

- 1 Confidentiality**
Hiding, locking data, access limitations, etc.
- 2 Integrity**
The trust on the data
- 3 Availability**
Availability of the data to be used

2 Concept of Data Security

Aspects should be considered regarding data security (Knox, D.)

Balance between security, usability & performance

- 4 Usability**
The ease to use the data
- 5 Performance**
Consider the system's performance

3 Data Security Analysis on Existing System

Existing spatial database model in Tax Office's LIS

Conceptual model

3 Data Security Analysis on Existing System

Problems according to Confidentiality

Confidentiality Aspect

- Folder sharing or installing the Tax Office's LIS application in every sections of the local tax offices
- Both of these methods could be used by unauthorized persons to illegally copy or change the spatial data.
- Simply making backup or copy(ies) of Tax Office's spatial data in CD-ROM & deliver it to Regional Office or Head Office.

3 Data Security Analysis on Existing System

Problems according to Integrity

Integrity Aspect

- Unauthorized persons could easily change the data
- No facility available to audit the data changes
- The existing application could not maintain data integrity

3 Data Security Analysis on Existing System

Problems according to Availability

Availability Aspect

- Data Backup system on existing application produces separate files. If 1 file is missing/damaged, the data could not be recovered.

3 Data Security Analysis on Existing System

Considered Aspects regarding Existing Data Security

Usability

Existing spatial data in Tax Office's LIS are easily used.

Performance

Tax Office's LIS performance is significantly decrease while being accessed by several users.

3 Data Security Analysis on Existing System



Threats Identified

1. **Illegal copying of spatial data** by unauthorized persons or even by Tax Office's staffs
2. **Unauthorized spatial data changes** which might strongly lead to state's revenue loss
3. **Damage of spatial data integrity**, caused by improper data update
4. **Unavailability of spatial data**, caused by improper data backup procedure

Question

- How to increase the Tax Office's Spatial Database security?



3 Security Policy



Data Security Improvement Alternatives, through improving:



Data handling procedures



Database security



Operating system security



Application security



Computer network security

3 Security Policy



Policy taken



To improve database security through Spatial Database Redesign

Reasons:

Main threat faced by Tax Office's spatial data is **data integrity**. It is strongly related to **database matter**.

Other threat faced is **data theft & data availability**. Today, most DBMS is equipped by facilities to arrange user's access privileges and data backup mechanism.

3 Security Policy



New Security Policy

1. TaxOffice's spatial data is **installed in one certain computer server only**
2. Tax Office's spatial data access is **strictly limited to certain personnels** of the Directorate General of Tax Office only
3. No person has rights to access the data in any way and for any reason without **authorization from the head of the Directorate General of Tax Office**
4. Only **authorized personnels** from the Directorate General of Tax Office are able to **update** the data.
5. Other personnels from the Directorate General of Tax Office **only have the right to access certain spatial data** according to his/her duty.
6. Tax Office Spatial Data **must be available in all working days** to support the taxation activities.

3 Security Policy

Existing Security Specification

Access Control Matrix

Data	Users *)	1	2	3	4	5	6	7	8	9
Province	r,w	r	r					r	r	r
Residency	r,w	r	r					r	r	r
District	r,w	r	r					r	r	r
Sub District	r,w	r	r					r	r	r
Block	r,w	r	r	r	r	r	r	r	r	r
Parcel	r,w	r,w	r	r	r	r	r	r	r	r
Building	r,w	r,w	r	r	r	r	r	r	r	r
Street	r,w	r	r	r	r	r	r	r	r	r
Stream	r,w	r	r	r	r	r	r	r	r	r
Symbol	r,w	r	r	r	r	r	r	r	r	r

Note: r = read w = write
 *) 1 = Administrator 2 = Non Administrator Personnel 3 = Head of Data & Valuation Section 4 = Service Point Officer 5 = Tax Determination Section Officer 6 = Revenue Section Officer 7 = Head of the Local Office 8 = Regional Tax Officer 9 = Officer of the Directorate General of Tax

4 Design

Existing Spatial Database Model

4 Design

Spatial Database Redesign

Conceptual Model

4 Perancangan dan Implementasi

Perancangan Ulang Basis Data Spasial

Model Fisikal Basis Data Spasial Penelitian

4 DESIGN

Design of Data Access Privilege

Grouping the Users

Making User's Hierarchy

Making Roles

System privilege

Object privilege

4 Design

Data Access Privilege Design

Object privileges

Table	Role*)	A	B	C	D	E
PROVINCES		s,i,u,d	s		s	s
REGENCIES		s,i,u,d	s		s	s
DISTRICTS		s,i,u,d	s		s	s
SUB DISTRICTS		s,i,u,d	s		s	s
BLOCKS		s,i,u,d	s	s	s	s
PARCELS		s,i,u,d	s,i,u,d	s	s	s
BUILDINGS		s,i,u,d	s,i,u,d	s	s	s
STREETS		s,i,u,d	s	s	s	s
STREAMS		s,i,u,d	s	s	s	s
SYMBOLS		s,i,u,d	s	s	s	s
USERS		s,i,u,d	s,u	s,u	s,u	s,u
UNITS		s,i,u,d	s	s	s	s
POSITION		s,i,u,d	s	s	s	s
PARCEL UPDATES		s,i,u,d	s,i,u,d			
BUILDING UPDATES		s,i,u,d	s,i,u,d			

Notes:
 object privileges:
 s = select,
 i = insert,
 u = update,
 d = delete

A = Role ADMIN
 B = Role DATA&VAL
 C = Role SERVICE PNT
 D = Role DIR. GEN.
 E = Role REGIONAL

4 Implementation

Implementing the Design in Oracle Spatial

Spatial Database in Oracle Spatial

Spatial Database in MapInfo

Comparison

Name	Size	Type
3278000001.DAT	271 KB	DAF File
3278000001.ID	32 KB	MapInfo Table File
3278000001.SHP	462 KB	MapInfo Table File
3278000001.PAMP	2.728 KB	MapInfo Table File
3278000001.TAB	1 KB	MapInfo Table
3278000001spg.DAT	128 KB	DAF File
3278000001spg.ID	24 KB	MapInfo Table File
3278000001spg.PAMP	670 KB	MapInfo Table File
3278000001spg.TAB	1 KB	MapInfo Table
327800000100.DAT	1 KB	DAF File
327800000100.ID	1 KB	MapInfo Table File
327800000100.PAMP	13 KB	MapInfo Table File
327800000100.TAB	1 KB	MapInfo Table
327800000101.DAT	21 KB	DAF File
327800000101.ID	2 KB	MapInfo Table File
327800000101.PAMP	25 KB	MapInfo Table File
327800000101.TAB	1 KB	MapInfo Table
327800000102.DAT	7 KB	DAF File
327800000102.ID	1 KB	MapInfo Table File
327800000102.PAMP	8 KB	MapInfo Table File
327800000102.TAB	1 KB	MapInfo Table
327800000103.DAT	1 KB	DAF File
327800000103.ID	1 KB	MapInfo Table File
327800000103.PAMP	3 KB	MapInfo Table File
327800000103.TAB	1 KB	MapInfo Table
327800000104.DAT	24 KB	DAF File
327800000104.ID	3 KB	MapInfo Table File

4 Implementation

Implementing the Design in Oracle Spatial

The Roles

Users [5]

- KANWIL
- DC.SIGPBB
- PEDANIL
- PELAYANAN
- PIMPINAN

System Privileges [173]

5 Analysis

New Spatial Database Model Tests

Subjects to Test

5 aspek keamanan data

Penguji

Pegawai DJP yang menjadi pengguna SIG PBB

Cara Menguji

Melakukan operasi pada basis data yaitu pemasukan data, pemutakhiran data, penghapusan data dan penyajian data

Data yang Digunakan

Data spasial dan data atribut KP PBB Depok

Pendapat Penguji

Untuk menampung pendapat penguji digunakan kuisioner

5 Analisis

Pengujian Basis Data Spasial hasil Rancang Ulang

Program yang digunakan untuk Menguji

5 Analysis

Confidentiality

- Role & user authentication used to limitate user's rights are well functioned.
- Illegal access to spatial database is much more difficult compared to the previous one.
- Yet, after the test, there are still some ways to penetrate the new model, e.g.:
 - Using operating system administrator's privileges

Problems in the Previous System

- Folder sharing or installing the Tax Office's LIS application in every sections of the local tax offices
- Making backup or copy(ies) of Tax Office's spatial data in CD-ROM & deliver it to Regional Office or Head Office.

5 Analysis

Integrity

- Only authorized person could edit/update the spatial data.
- Data update audit facility is well functioned.
- Referential integrity could be well maintained. Even the spatial database could be accessed, it's difficult to change the data against it's referential integrity

Problems in the previous system

- Any unauthorized person could easily change the data
- No facility available to audit the data changes
- The existing application could not maintain data integrity

5 Analysis

Availability

In Oracle Spatial, the backup system produces one solid file, which will decrease the possibility of file damage.

Yet, one can make copy of the backup file, restore it in another computer and accesses the data.

Problems in the previous system

Data Backup system on existing application produces separate files. If 1 file is missing/damaged, the data could not be recovered.

5 Analysis persistent

Usability

Using Oracle Spatial, the usability of New Spatial Database is still persistent.

Previous condition

Existing spatial data in Tax Office's LIS are easily used.

performance

Tax Spatial database using Oracle Spatial could handle simultaneous data access without decreasing its performance.

Previous condition

Tax Office's LIS performance is significantly decrease while being accessed by several users.

5 Analysis

Continuing Improvement of Spatial Data Security

According to the test, a few data security gaps are still found. It means the Spatial Database Improvement should be followed up by implementing another data security alternatives.

Operating System's Administrator Account

- Do certain settings in the operating systems, regarding user accounts & user privileges.
- Establishing standard procedure regarding persons which have administrator privileges.

Accessing copy of backup file.

- Establishing data handling procedure, particularly data backup procedure.

6 Conclusions

Redesigning Spatial Database using Spatial DBMS could improve the security of Tax Office's Spatial Database

Confidentiality

- Could be improved through implementing roles & privileges of the Spatial DBMS
- Operating System's Administrator Account problem has not been overwhelmed yet.

Integrity

- Could be improved by implementing :
 - Spatial DBMS's privileges
 - Referential integrity

Availability

- Could be increased through Spatial DBMS backup mechanism
- Yet, backup file could still easily be restored to improper computer(s)

6 Conclusions

Usability

By using Spatial DBMS, the ease of Tax Office's Spatial Database usability could still be persisted.

Performance

By using Spatial DBMS, the performance of Tax Office's Spatial Database could be significantly increased.

5 Suggestions

To have a secured Tax Office's spatial database thoroughly, studies regarding system's procedure, operating systems, application and network should be undertaken as well.

Demo

Kerahasiaan (*confidentiality*)

Integritas (*integrity*)

Ketersediaan (*availability*)

Penggunaan (*usability*) dan kinerja (*performance*)

THANK YOU