How to secure Stata in a secure environment?

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background/motivation

New data extraction and delivery project:

- legislation/regulations/corporate guidelines
- ultimatum: secure Stata use (or ...)

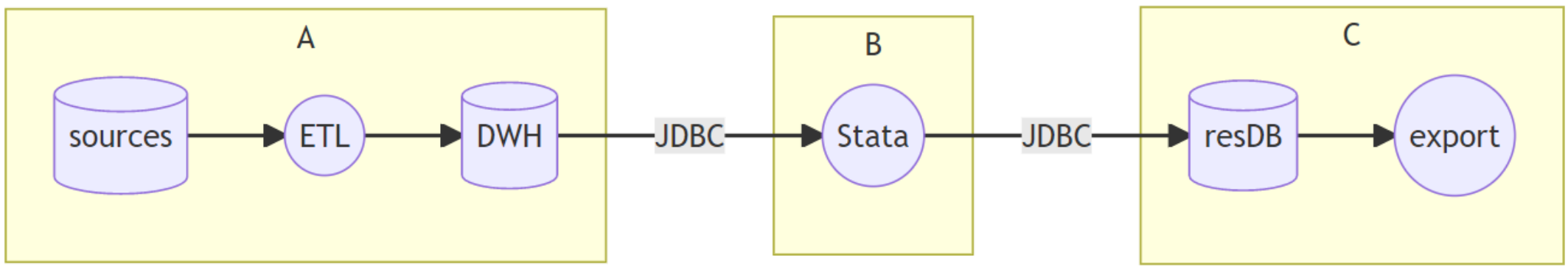
cancer patient data

- data integrity
- privacy of sensitive data (information on health issues)
- monitoring/logging: who did what when with data

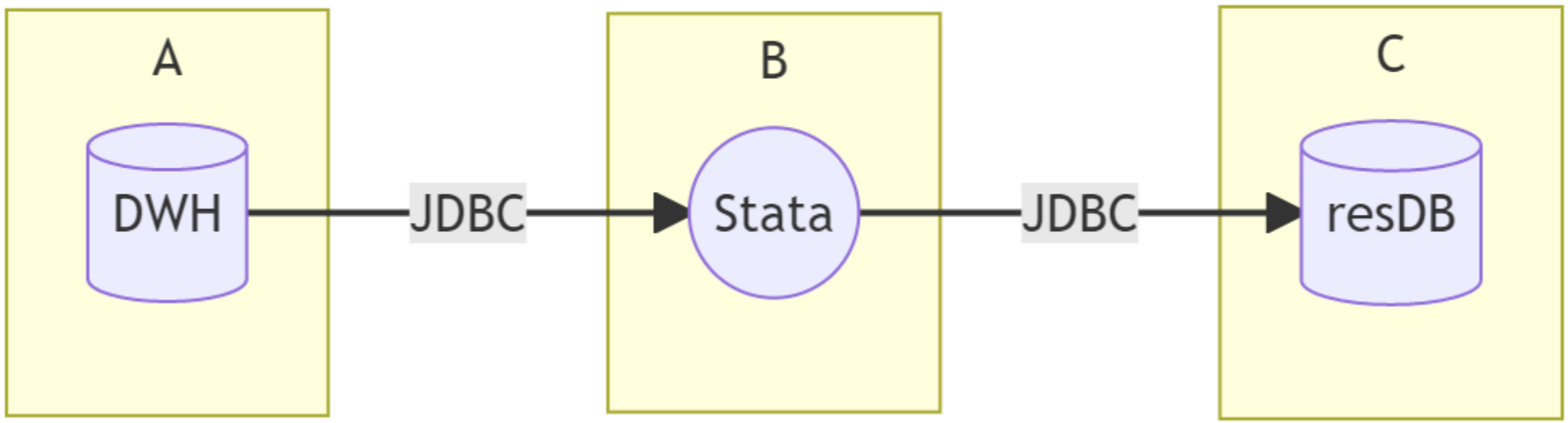
CHALLENGE: Stata is basically open:

- read/write data
- optional logging
- Stata jdbc add (clear text password)

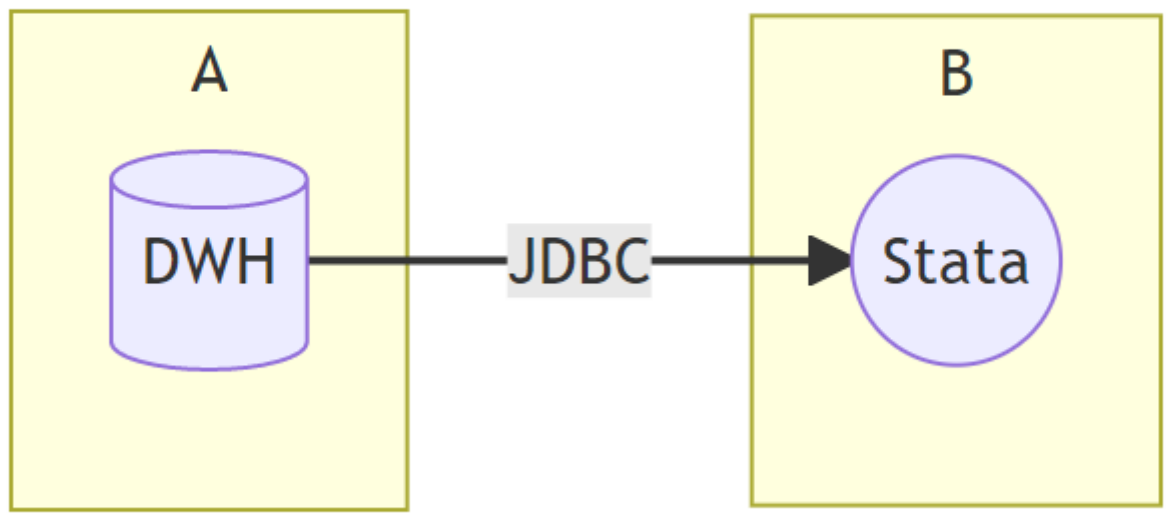
CONTEXT: data flow



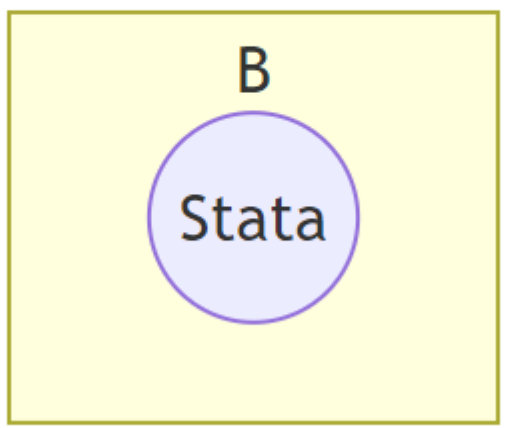
data flow



data flow



Stata

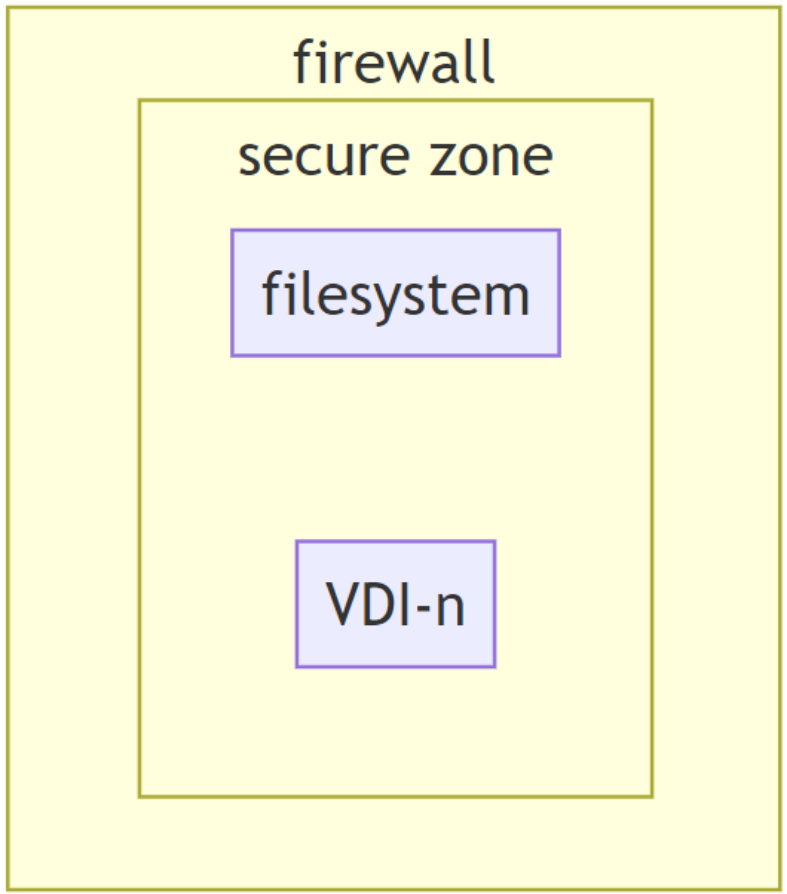


securing Stata

- define trusted/private network zone
- Java plugin for DB access and audit logging
- logging of Stata session

define trusted/private network zone

- firewall restrict data communication by rules
- private file server/file system (Stata network installation)
- personal clients (persistent VDI VMware Horizon Clients for Windows)

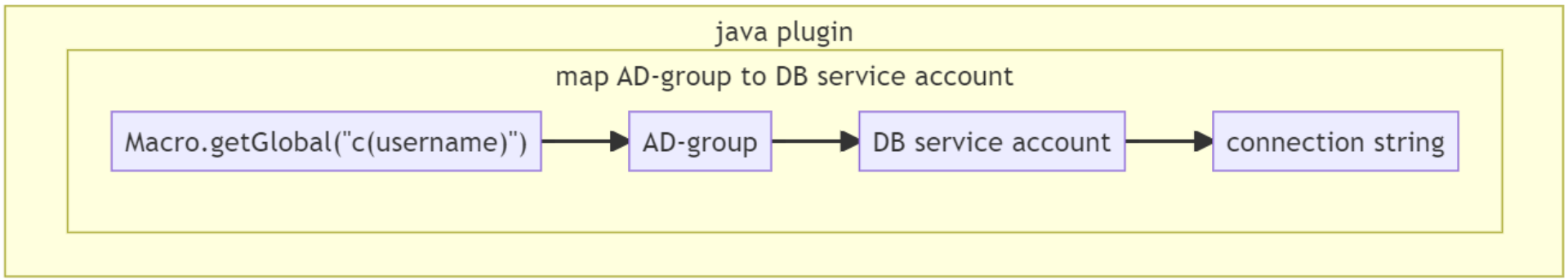


Java plugin for DB access via JDBC

- provides connection string
- hides JDBC connection password
- provides audit log of data load (who did what when)

Java plugin

- Reads *c(username)*. The user is *authenticated* when logging into the VDI
- Finds AD-group for user
- Maps AD-group to a *database service account*
- Decrypt and provide password for *database service account*



- The java plugin provides a connection string including a secret password stored (encrypted) in java resource file
- The user does not know the password
- The *DB service account* provide *autorization* to relevant data in DB
- Next verson will use Vault (HashiCorp) to provide short lived password (password rotation)

java code (elements) using Stata-Java API (https://www.stata.com/java/api17/)

```java
import com.stata.sfi.Macro;
import com.stata.sfi.SFIToolkit;

//Service stata commands to disable debugging and tracing
SFIToolkit.executeCommand("set trace off", false);
SFIToolkit.executeCommand("set debug off", false);

//Template connection string
String run_jdbc_add_dsn =
  "capture noi jdbc add " + jdbcConnectionValues.get("DSN") + ", " +
  "jar(\"" + jdbcConnectionValues.get("JAR") + "\") " +
  "driverclass(\"" + jdbcConnectionValues.get("CLASS") + "\") " +
  "url(\"" + jdbcConnectionValues.get("URL") + "\") " +
  "user(\"" + jdbcConnectionValues.get("USERNAME") + "\") " +
  "password(\"" + jdbcConnectionValues.get("PASSWORD") + "\")";

 //Execute the stata command
 int jdbc_add_dsn_result = SFIToolkit.executeCommand(run_jdbc_add_dsn, false);
```

What do the user do to fetch data from DB?

```
* typically define SQL select statment in filename.sql

KRG_KNUT_DWH_load, sqlfile("filename.sql")
```

```
prog define KRG_KNUT_DWH_load, ///
    nclass ///
    properties(KRG_KNUT_DWH)

findfile java_auditlog_plugin.jar // dependiencies (plugin)

version 17

syntax, sqlfile(string) [DIsplay]

confirm file "`sqlfile'"
scalar sql = fileread("`sqlfile'")
local sql = ///
    char(34) ///
    + trim(itrim(ustrregexra(scalar(sql),"\s|\x09|\x0a|\x0d"," "))) ///
    + char(34)

javacall krg.JavaAuditlogPlugin executeSql, jars(java_auditlog_plugin.jar)

if ("`display'" != "") {

        di _n _n  "`sqlfile'"
        di scalar(sql)
}

end
```

java code (elements) using Stata-Java API (https://www.stata.com/java/api17/)

```
//Get the sql from Stata
String sql = Macro.getLocal("sql");
String run_jdbc_load_sql =
 "capture noi jdbc load, exec(" + sql + ")" + " " + "clear";

//run Stata jdbc load
SFIToolkit.executeCommand(run_jdbc_load_sql, false);

//run standard Stata commands
SFIToolkit.executeCommand("noi compress", false);
SFIToolkit.executeCommand("noi describe", false);
```

KRG_KNUT_DWH_load

```
KRG_KNUT_DWH_load, sqlfile("filename.sql")
```

- Call the *executeSql* method, the only method exposed to user:
  - provide connection (jdbc add)
  - fetch data (jdbc load)
  - close connection (trick: jdbc add non-existing URL)

```
javacall krg.JavaAuditlogPlugin executeSql, jars(java_auditlog_plugin.jar)
```

Stata session log

- logging Stata session (started by sysprofile.do)
- monitoring Stata session log for illegal commands every x seconds (GoAnyWhere)
- moving Stata session log files for archiving (GoAnyWhere) for x months

What Stata properties made this possible?

- Stata jdbc command
- Stata-Python API (https://www.stata.com/python/api17/Data.html) for fast prototyping
- Stata-Java API (https://www.stata.com/java/api17/)

What would we add to Stata?

- JDBC close connection command
- run default commands at end of session (like sysprofile.do)

What did StataCorp fix?

- FIX update 04oct2022: jdbc load, when loading CLOB data, produced error when a NULL value was encountered.

What has been solved?

- restricting data reading/writing (plugin)
- logging of data reading/writing (plugin)
- avoiding clear text password (plugin)
- forced logging of Stata session including monitoring of content

Not covered

- formal guidelines for use
- training
- git/gitlab

Thanks