COSYLAB
CONTROL SYSTEM LABORATORY

Device Control Database Tool (DCDB)

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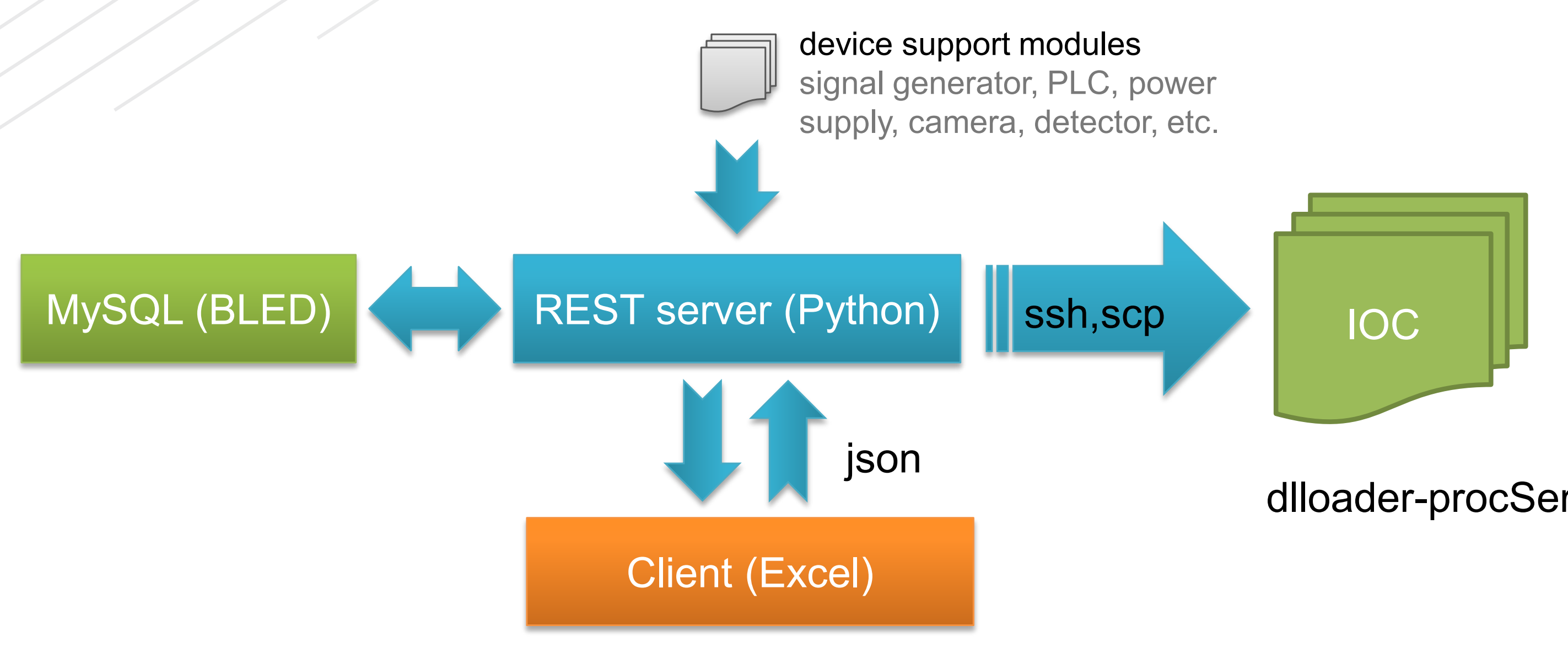
Abstract

In a physics facility containing numerous instruments, it is advantageous to reduce the amount of effort and repetitive work needed for changing the control system (CS) configuration: adding new devices, moving instruments from beamline to beamline, etc. We have developed a CS configuration tool, which provides an easy-to-use interface for quick configuration of the entire facility. It uses Microsoft Excel as the front-end application and allows the user to quickly generate and deploy IOC configuration (EPICS start-up scripts, alarms and archive configuration) onto IOCs; start, stop and restart IOCs, alarm servers and archive engines, etc. The DCDB tool utilizes a relational database, which stores information about all the elements of the accelerator. The communication between the client, database and IOCs is realized by a REST server written in Python. The key feature of the DCDB tool is that the user does not need to recompile the source code. It is achieved by using a dynamic library loader, which automatically loads and links device support libraries. The DCDB tool is compliant with CODAC (used at ITER and ESS), but can also be used in any other EPICS environment.

DCDB architecture



Software

- MySQL database (BLED)
- Python back-end (flask-restful, sqlalchemy, paramiko)
- Microsoft Excel front-end (C# .NET)
- ESS CODAC v.4.1
- procServ (developed by Ralph Lange)
- dlloader (Dirk Zimoch, PSI)

Device support modules

- Create a support module (using dlloader epics template):

```
bled@bled:~$ mvn newunit -Dunit=m-BeamPositionMonitor
bled@bled:~$ cd m-BeamPositionMonitor
bled@bled:~$ mvn newdlloader
bled@bled:~$ mvn clean compile test package
```

- Register support module with BLED database using bled import tool:

```
bled@bled:~$ bled
Usage: bled [--pom=] [--pre=] [--db=] [-v] [--help] [--version] [[--delete]]
```

- Files to deploy:

```
├── db
│   └── BeamPositionMonitor.db
├── dbd
│   └── BeamPositionMonitor.dbd
├── init.cmd
├── init-post.cmd
├── init-pre.cmd
└── lib
    └── linux-x86_64
        ├── libBeamPositionMonitor.a
        └── libBeamPositionMonitor.so
```

Dynamic library loader

- is an EPICS-based tool (in the form of IOC or shared library)
- load device support libraries "on the fly" (no need to recompile IOCs)
- just issue *require <lib_name>* in the EPICS iocshell
- uses procServ for attaching the terminal to the IOC shell
- integrated in CODAC v.4

Back-end

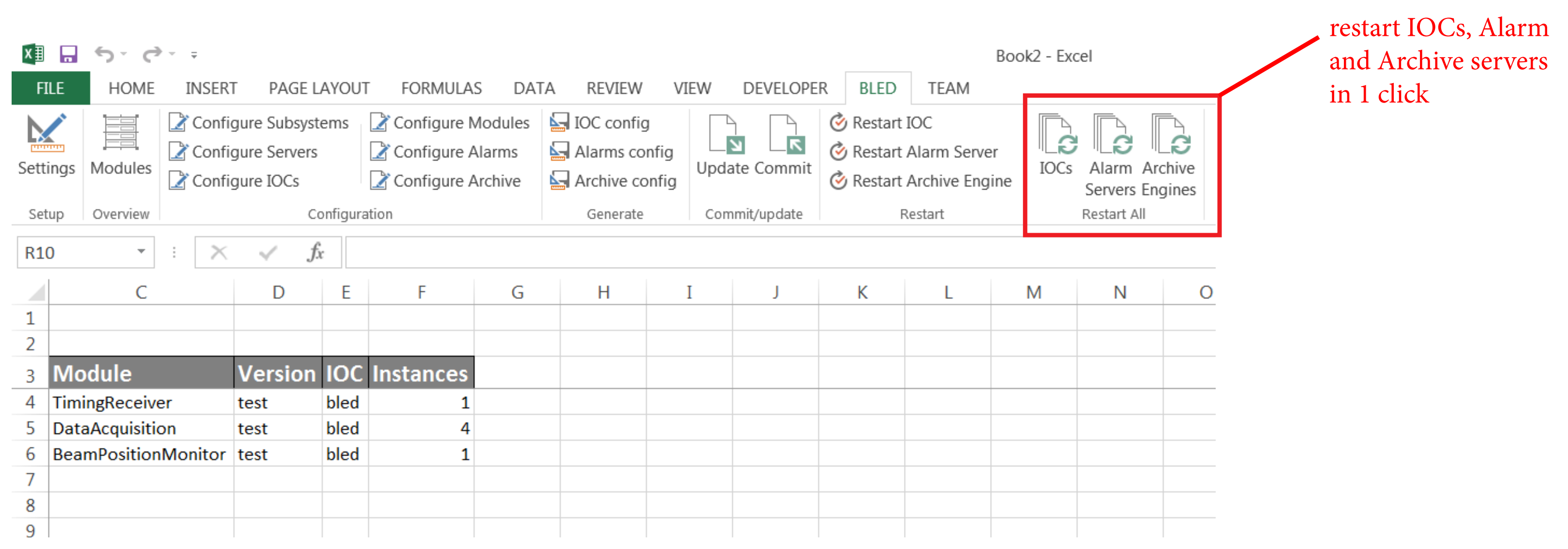
- REST server written in Python
- Uses JSON as the data exchange format
- Uses SSH to deploy configuration onto IOCs
- Deployed as CODAC-service:

```
bled@bled:~$ bled-server
Usage: bled-server {start|stop|status|restart|fg} [--port=]
```

- Supports logging

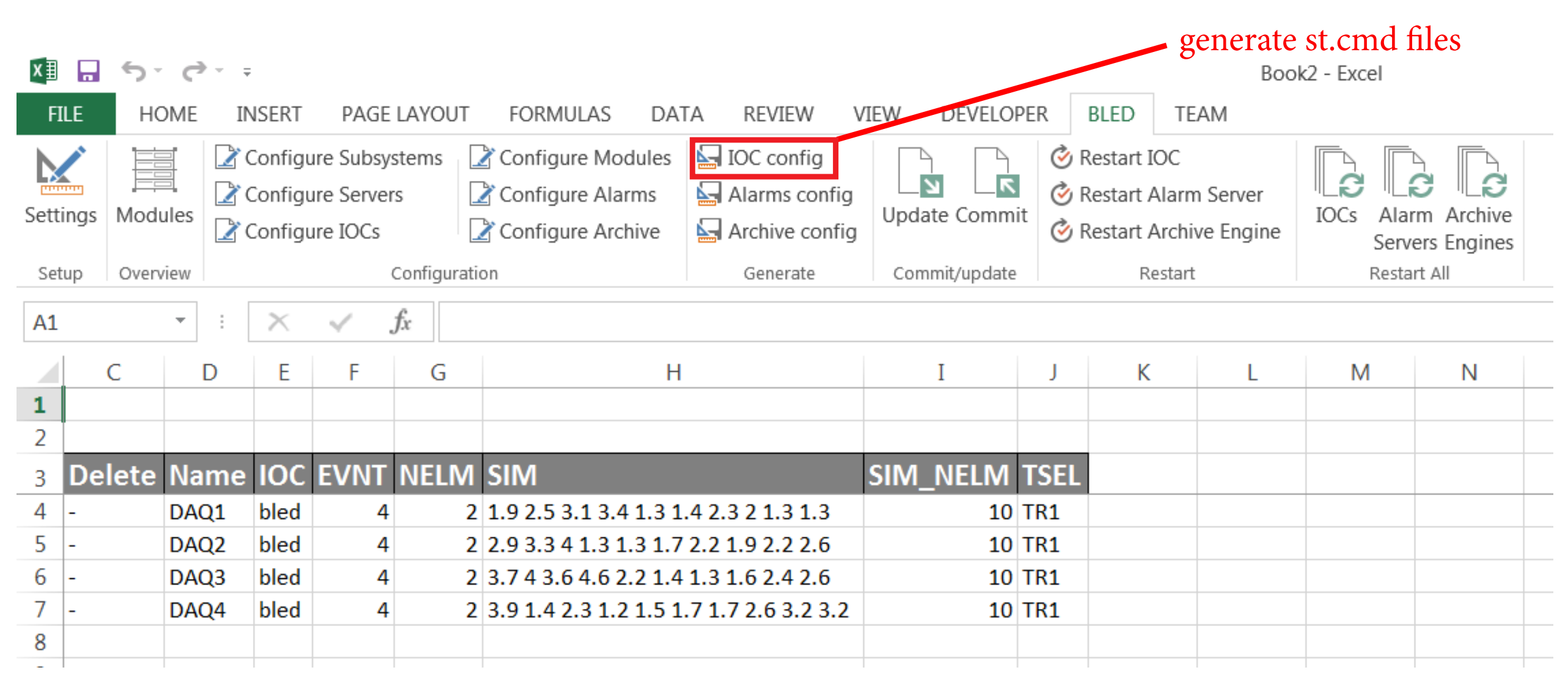
Front-end

- Modules list:


restart IOCs, Alarm and Archive servers in 1 click
Book2 - Excel
FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER BLED TEAM
Settings Modules Configure Subsystems Configure Servers Configure IOCs Configure Modules Configure Alarms Configure Archive IOC config Alarms config Archive config Update Commit Restart IOC Restart Alarm Server Restart Archive Engine IOCs Alarm Servers Archive Engines
Setup Overview Configuration Generate Commit/update Restart Restart All
R10

Module	Version	IOC	Instances
TimingReceiver	test	bled	1
DataAcquisition	test	bled	4
BeamPositionMonitor	test	bled	1

- Module instances (fields correspond to the ones configured in init-pre.cmd):


generate st.cmd files
Book2 - Excel
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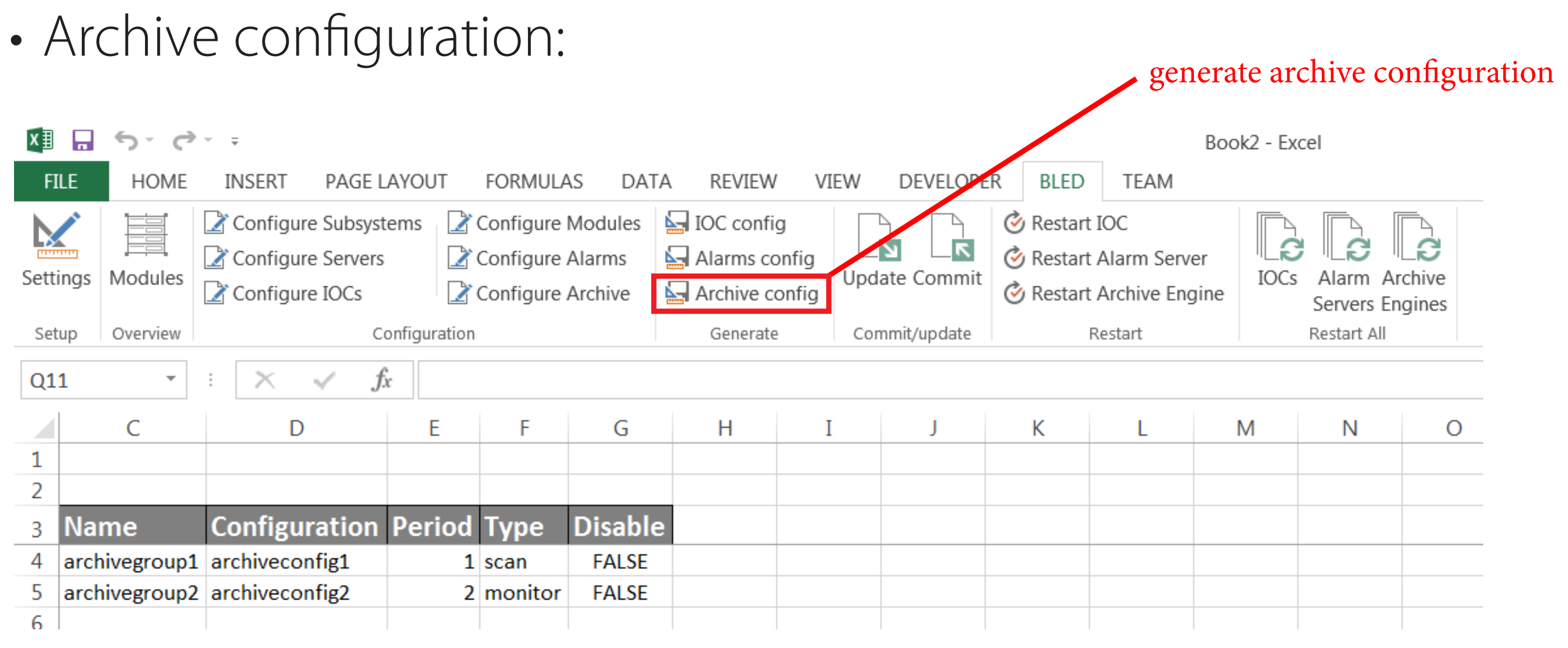
Setup Overview Configuration Generate Commit/update Restart Restart All
A1

Delete	Name	IOC	EVNT	NELM	SIM	SIM_NELM	TSEL
-	DAQ1	bled	4	2	1.9 2.5 3.1 3.4 1.3 1.4 2.3 2 1.3 1.3	10	TR1
-	DAQ2	bled	4	2	2.9 3.3 4 1.3 1.3 1.7 2.2 1.9 2.2 2.6	10	TR1
-	DAQ3	bled	4	2	3.7 4 3.6 4.6 2.2 1.4 1.3 1.6 2.4 2.6	10	TR1
-	DAQ4	bled	4	2	3.9 1.4 2.3 1.2 1.5 1.7 1.7 2.6 3.2 3.2	10	TR1

- Archive configuration:


generate archive configuration
Book2 - Excel
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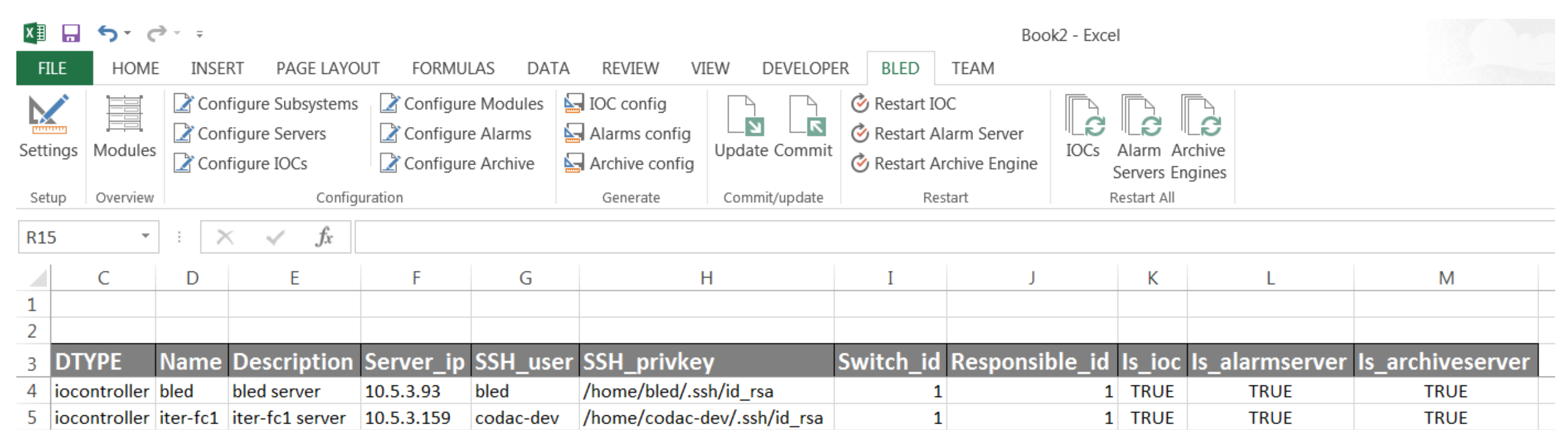
Q11

Name	Configuration	Period	Type	Disable
archivegroup1	archiveconfig1	1	scan	FALSE
archivegroup2	archiveconfig2	2	monitor	FALSE

- Servers configuration:


Book2 - Excel
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Setup Overview Configuration Generate Commit/update Restart Restart All
R15

DTYPE	Name	Description	Server_ip	SSH_user	SSH_privkey	Switch_id	Responsible_id	Is_ioc	Is_alarmserver	Is_archiveserver
iocontroller	bled	bled server	10.5.3.93	bled	/home/bled/.ssh/id_rsa	1	1	TRUE	TRUE	TRUE
iocontroller	iter-fc1	iter-fc1 server	10.5.3.159	codac-dev	/home/codac-dev/.ssh/id_rsa	1	1	TRUE	TRUE	TRUE

RPM packages

- m-common (complemented with dlloader support)
- m-maven-iter-plugin (complemented with dlloader support)
- m-codac-unit-api (complemented with dlloader support)
- m-epics-dlloader (IOC, library, EPICS templates, stcmdsaver service)
- m-python-modules (vendor python packages)
- m-python-bled-rest (REST server, import tool)
- m-dotnet-bled-ribbon (client in the form of a MS Excel add-on)

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