Feasibility Study of the IEEE 802.19.1 TVWS Coexistence Protocol

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Abstract

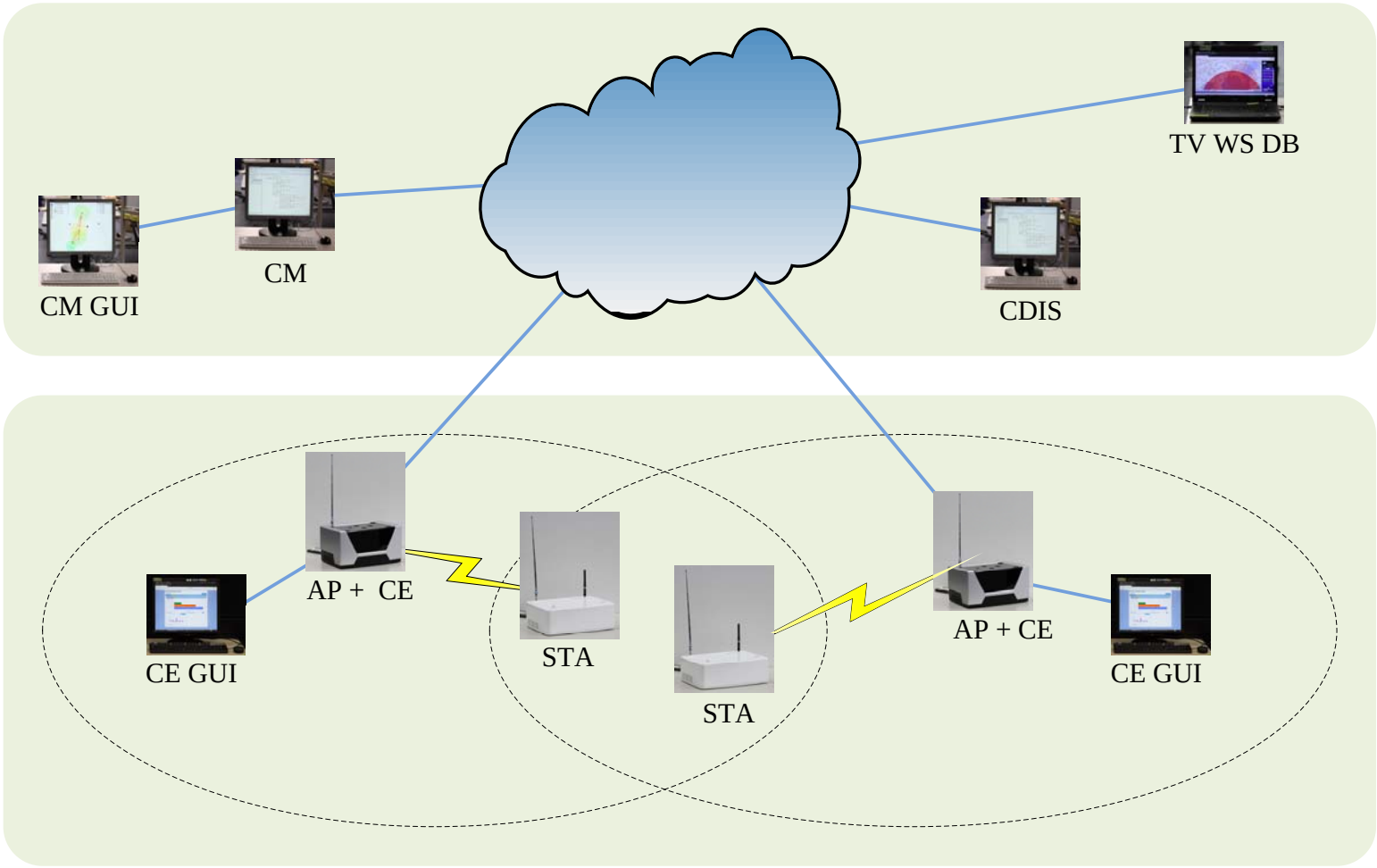
- **This contribution introduces the results of a feasibility study of the IEEE 802.19.1 TVWS coexistence protocol**

Outline

- **Evaluation system**
- **Scenario 1**
  - Information service
  - 802.11 in TVWS with 5 MHz bandwidth
- **Scenario 2**
  - Management service
  - 802.11 in TVWS with 5 MHz and 10 MHz bandwidth

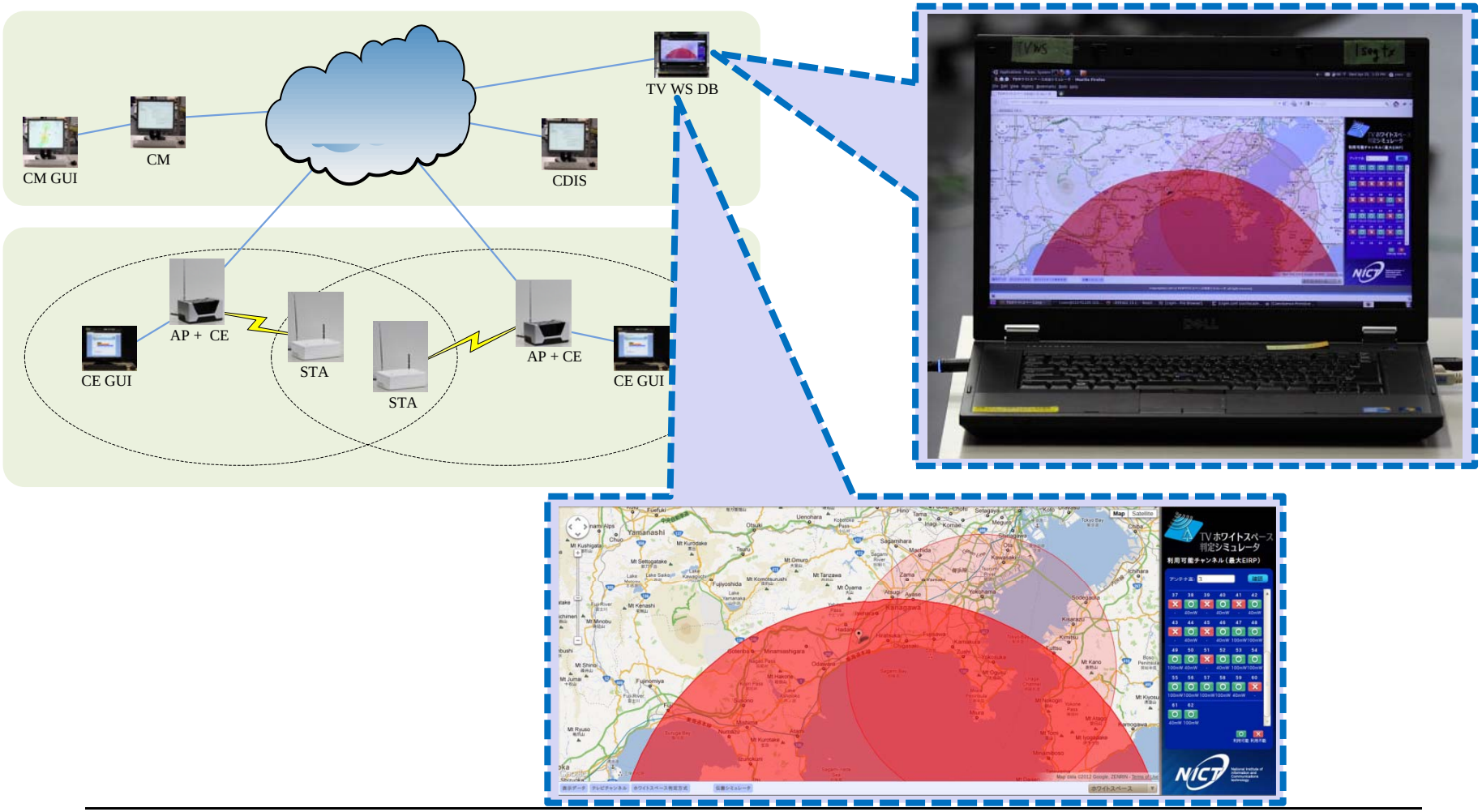
Evaluation system

Key components



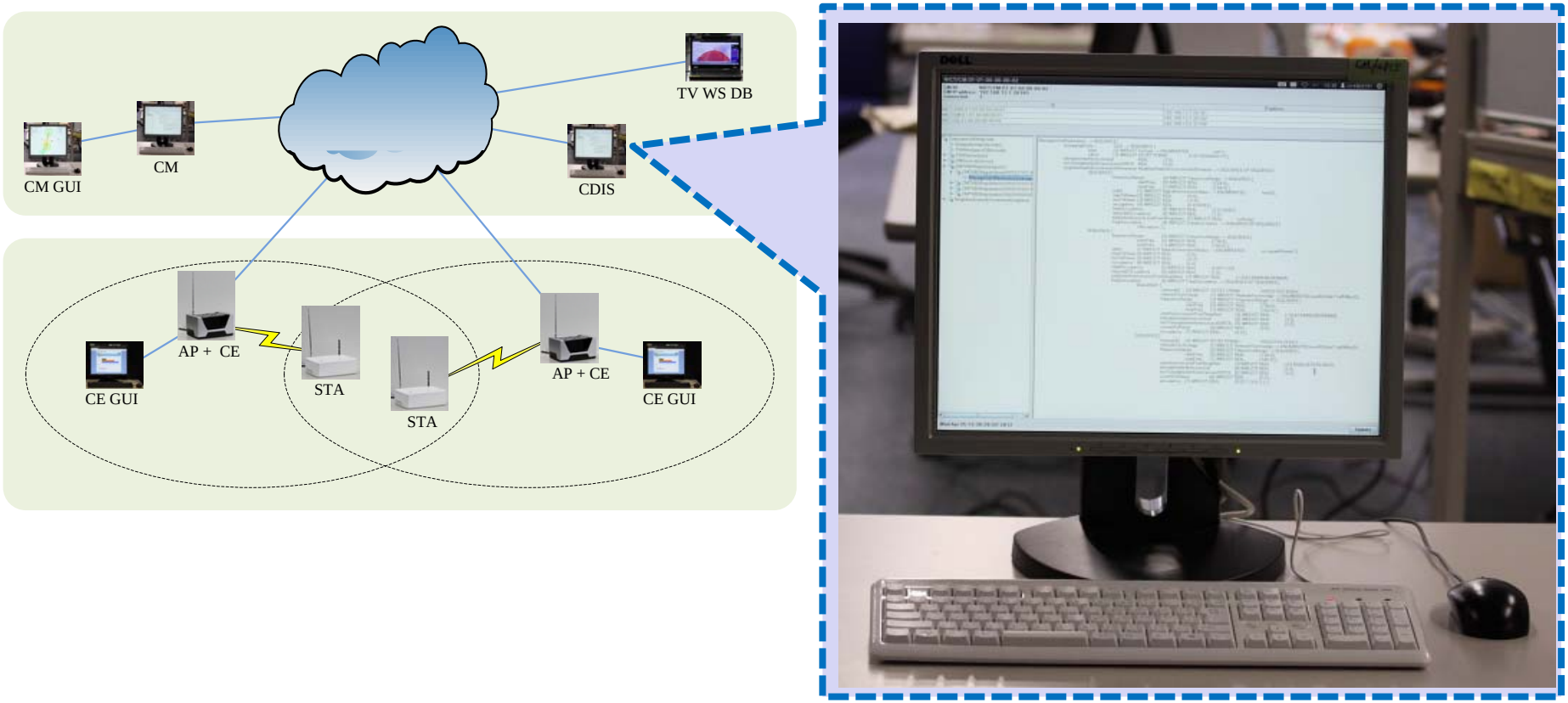
Evaluation system

TVWS DB client



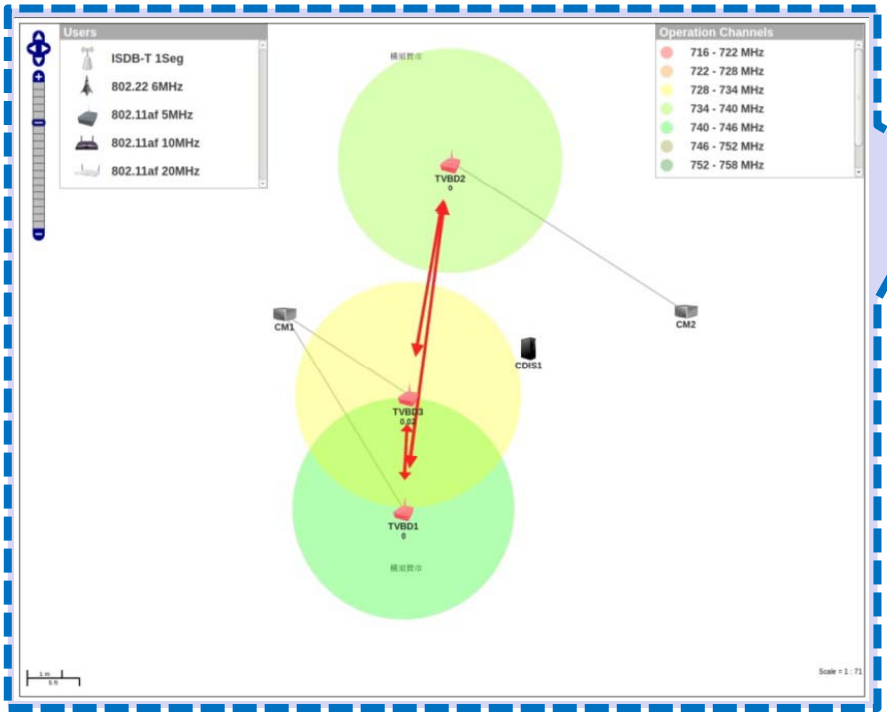
Evaluation system

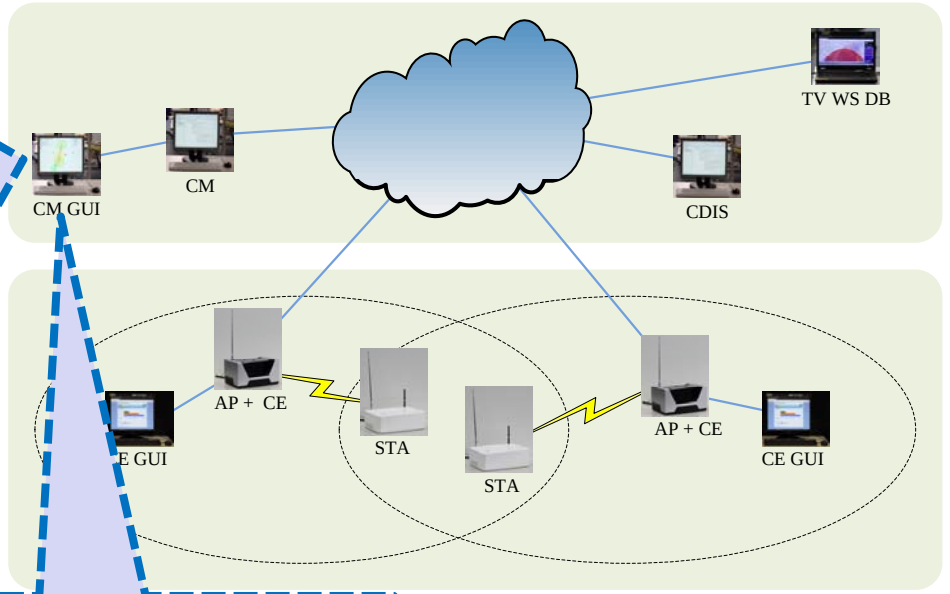
CDIS MIB

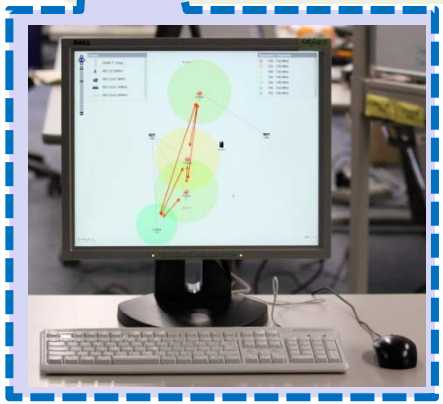


Evaluation system

CM GUI

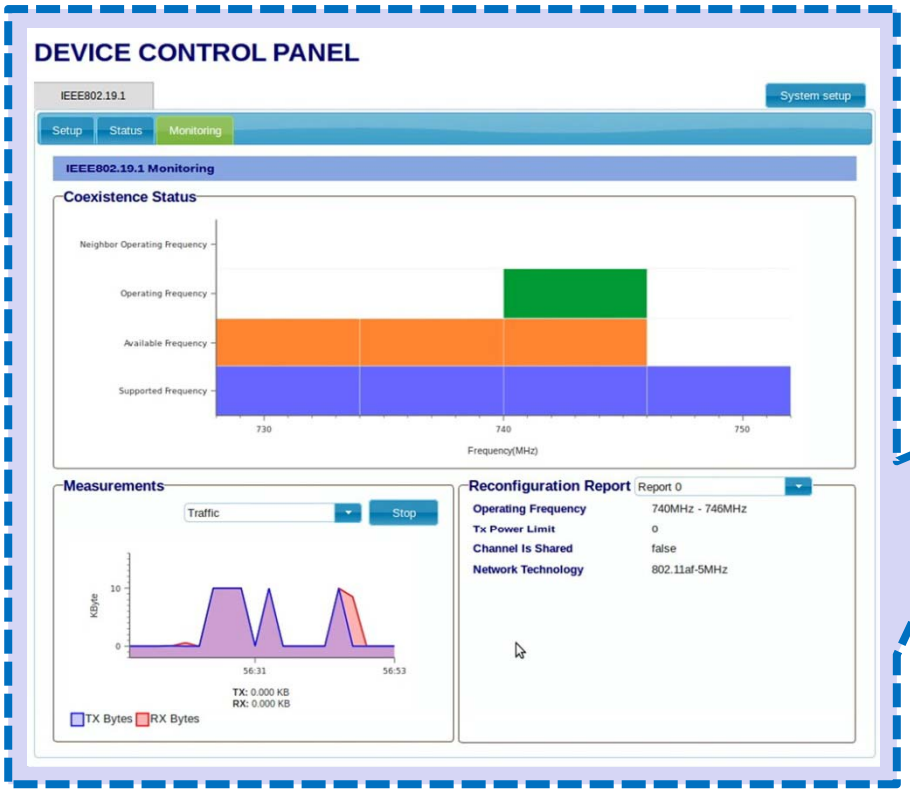


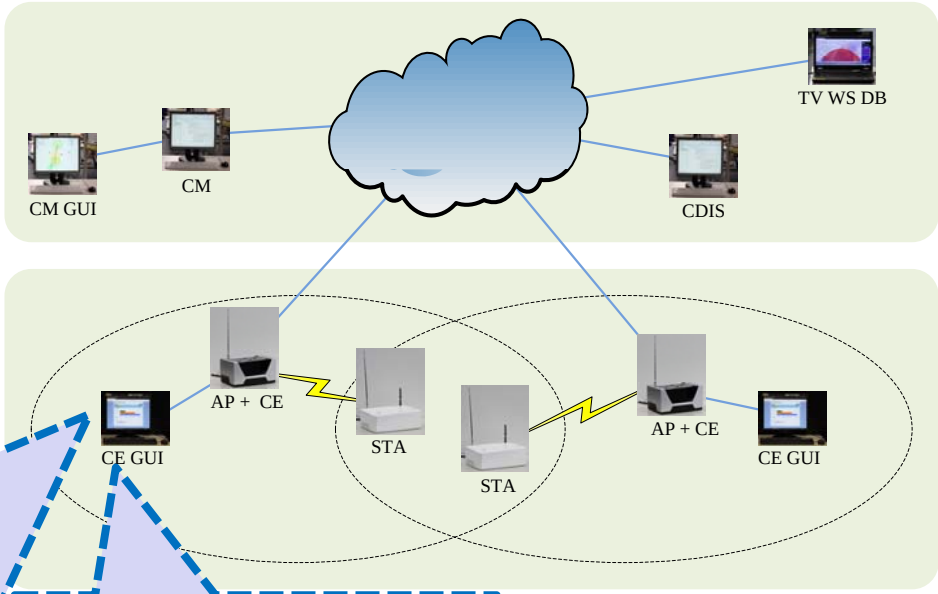


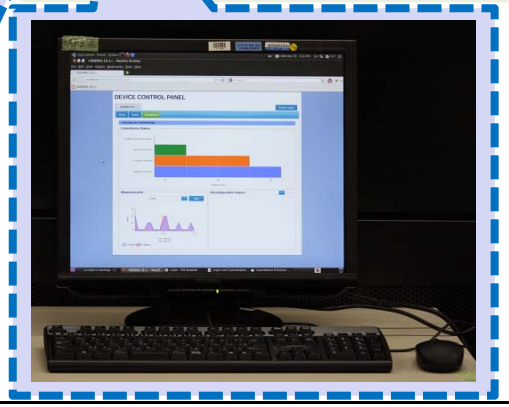


Evaluation system

CE GUI

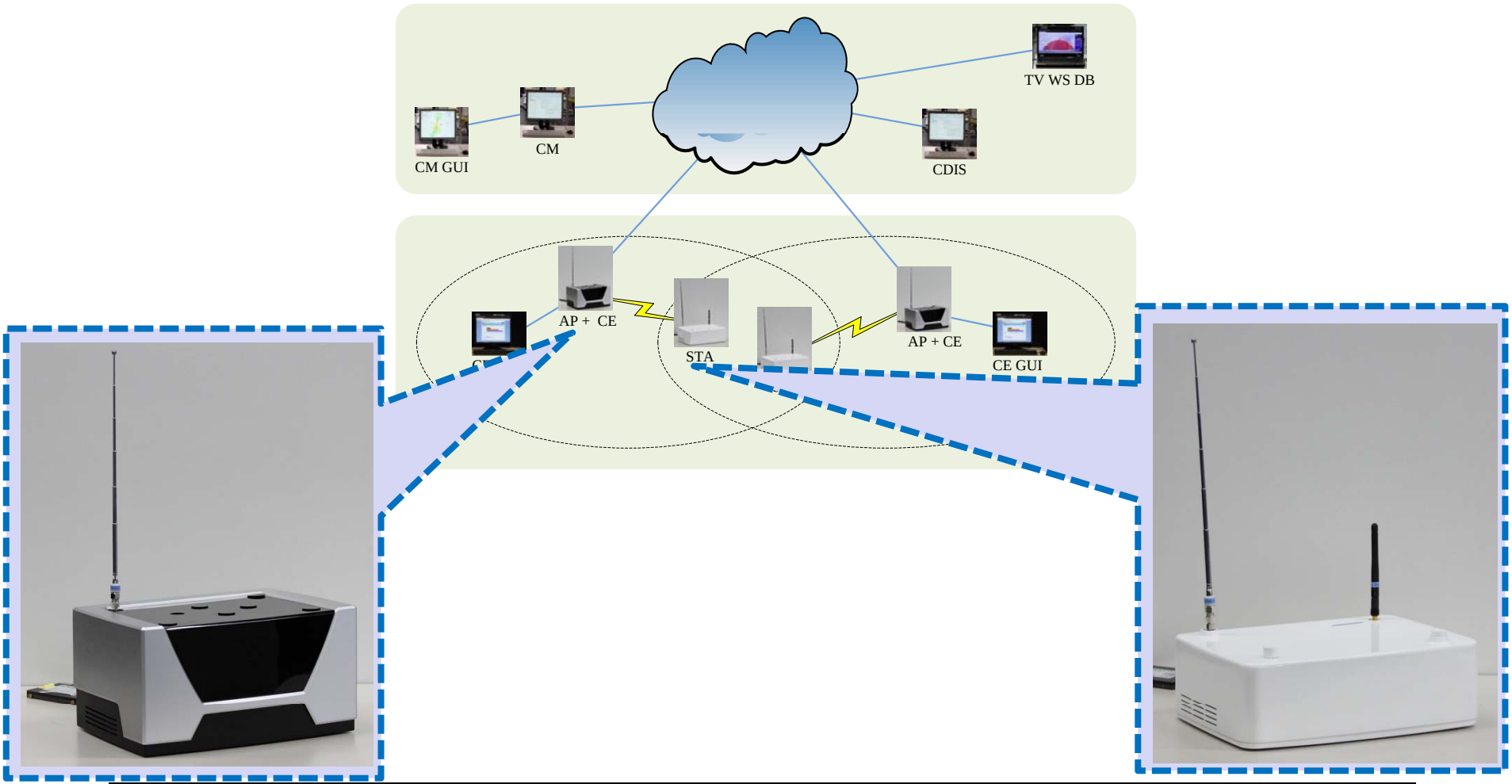






Evaluation system

802.11 in TVWS AP and STA



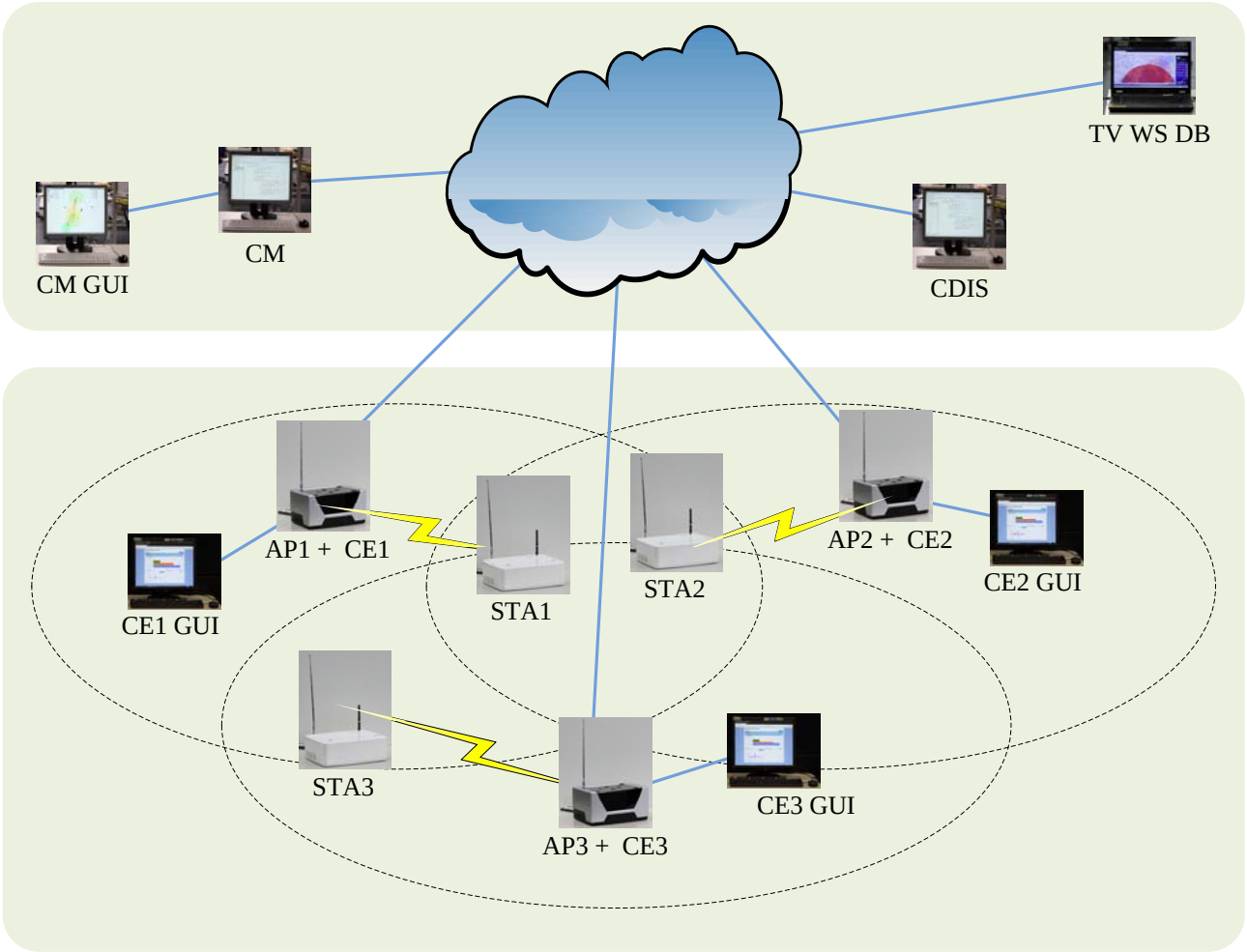
Scenario 1

- **This scenario evaluates IEEE 802.19.1 coexistence protocol for 802.11 in TVWS with 5 MHz bandwidth WSOs**
- **Three 802.11 networks are deployed each having one access point and one station**
- **Each 802.11 network has frequency band of 5 MHz and three available channels**
  - 728-734 MHz
  - 734-740 MHz
  - 740-746 MHz

Scenario 1

- **All three networks are served by one CM**
- **All three networks are subscribed to information service**

Scenario 1

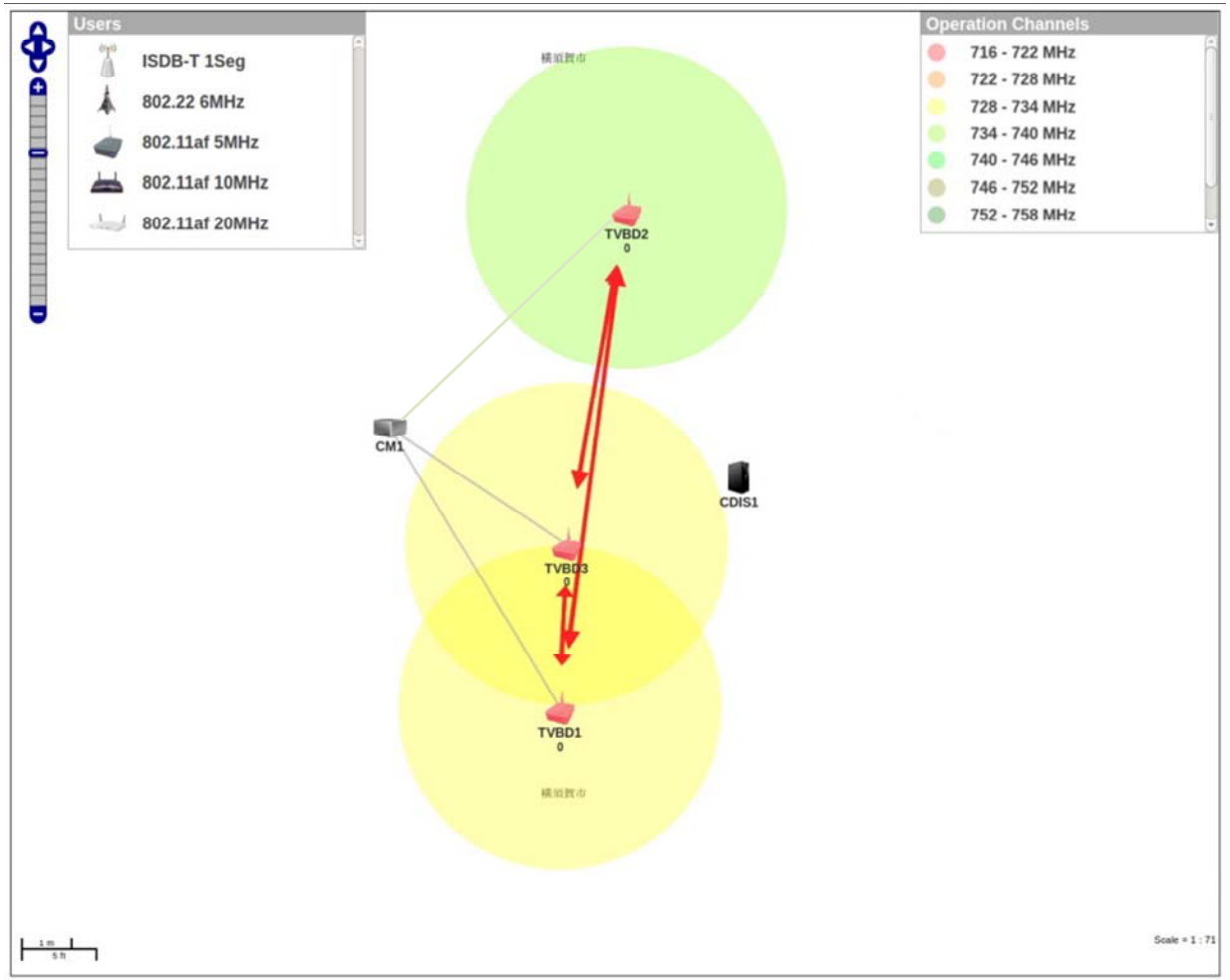

TV WS DB
CM GUI
CM
CDIS
AP1 + CE1
CE1 GUI
STA1
STA2
AP2 + CE2
CE2 GUI
STA3
AP3 + CE3
CE3 GUI

Scenario 1

1. Access point 1 and station 1 start operation
2. Access point 2 and station 2 start operation
3. Access point 3 and station 3 start operation
4. Access point 1 and station 1 join IEEE 802.19.1 coexistence system
5. Access point 2 and station 2 join IEEE 802.19.1 coexistence system
6. Access point 3 and station 3 join IEEE 802.19.1 coexistence system

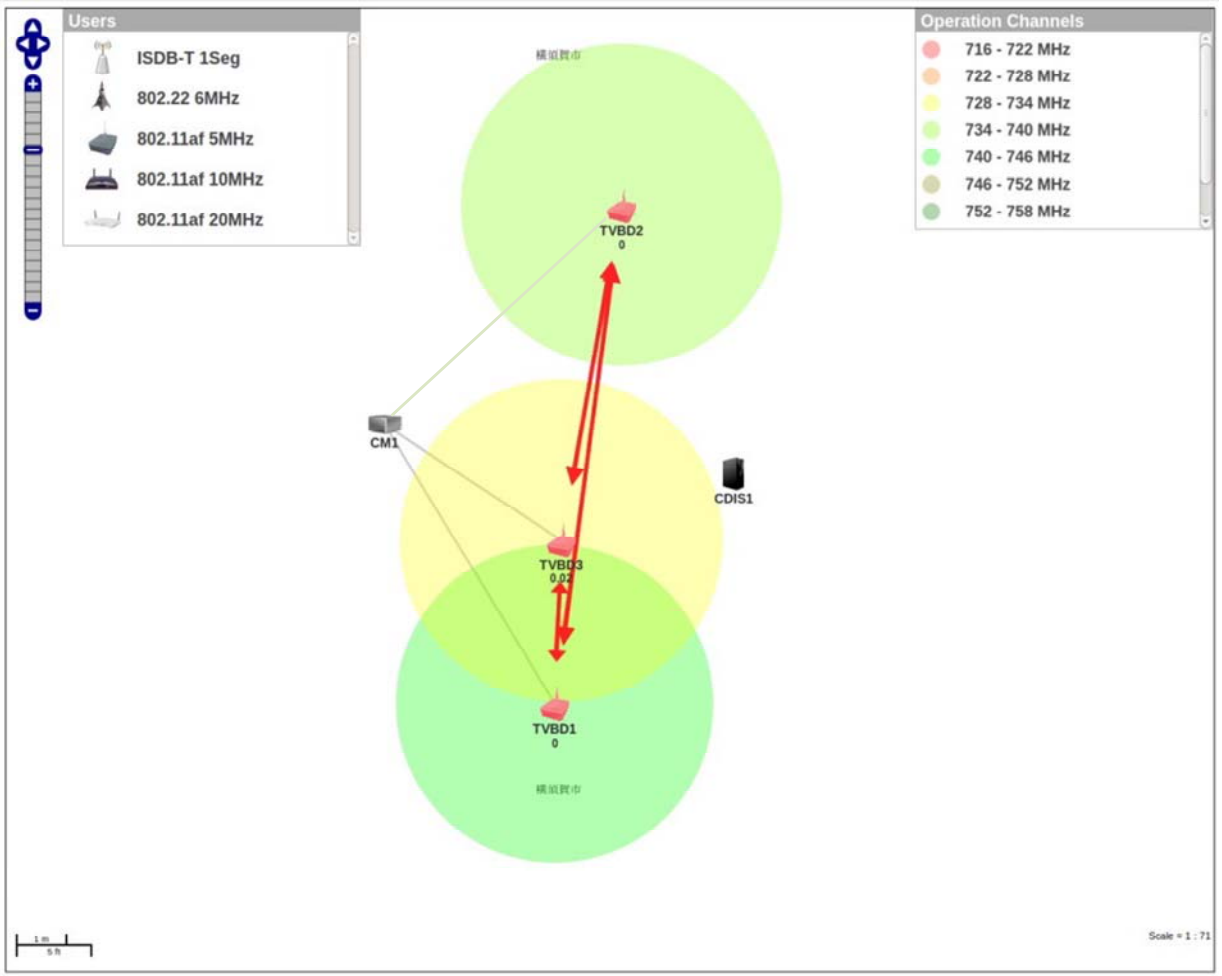
Scenario 1

Before joining IEEE 802.19.1 coexistence system



Scenario 1

After joining IEEE 802.19.1 coexistence system



Scenario 2

- **This scenario evaluates IEEE 802.19.1 coexistence protocol for 802.11 in TVWS with 5 MHz and 10 MHz bandwidth WSOs**
- **Three 802.11 5 MHz networks are deployed each having one access point and one station**
  - Networks 1, 2, and 3
- **Two 802.11 10 MHz networks are deployed each having one access point and one station**
  - Networks 4 and 5

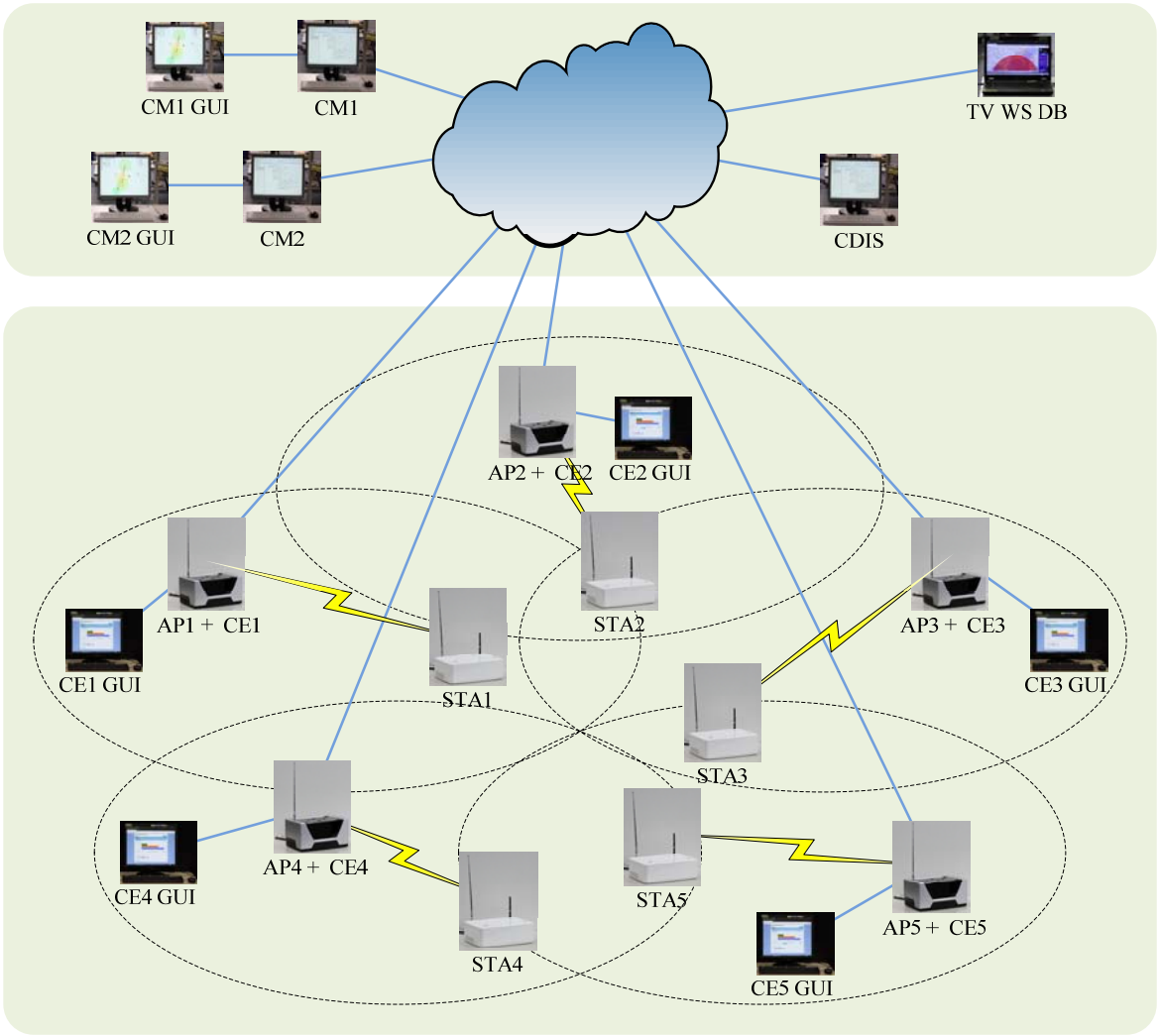
Scenario 2

- **Available frequency bands**
  - Network 1 (5 MHz)
    - 728-734 MHz
    - 746-752 MHz
  - Network 2 (5 MHz)
    - 734-740 MHz
    - 746-752 MHz
  - Network 3 (5 MHz)
    - 746-752 MHz
  - Network 4 (10 MHz)
    - 728-734 MHz
    - 734-740 MHz
    - 740-746 MHz
  - Network 5 (10 MHz)
    - 728-734 MHz
    - 734-740 MHz
    - 740-746 MHz

Scenario 2

- **Networks 1, 2, and 3 are served by CM 1**
- **Networks 4 and 5 are served by CM 2**
- **All networks are subscribed to management service**

Scenario 2

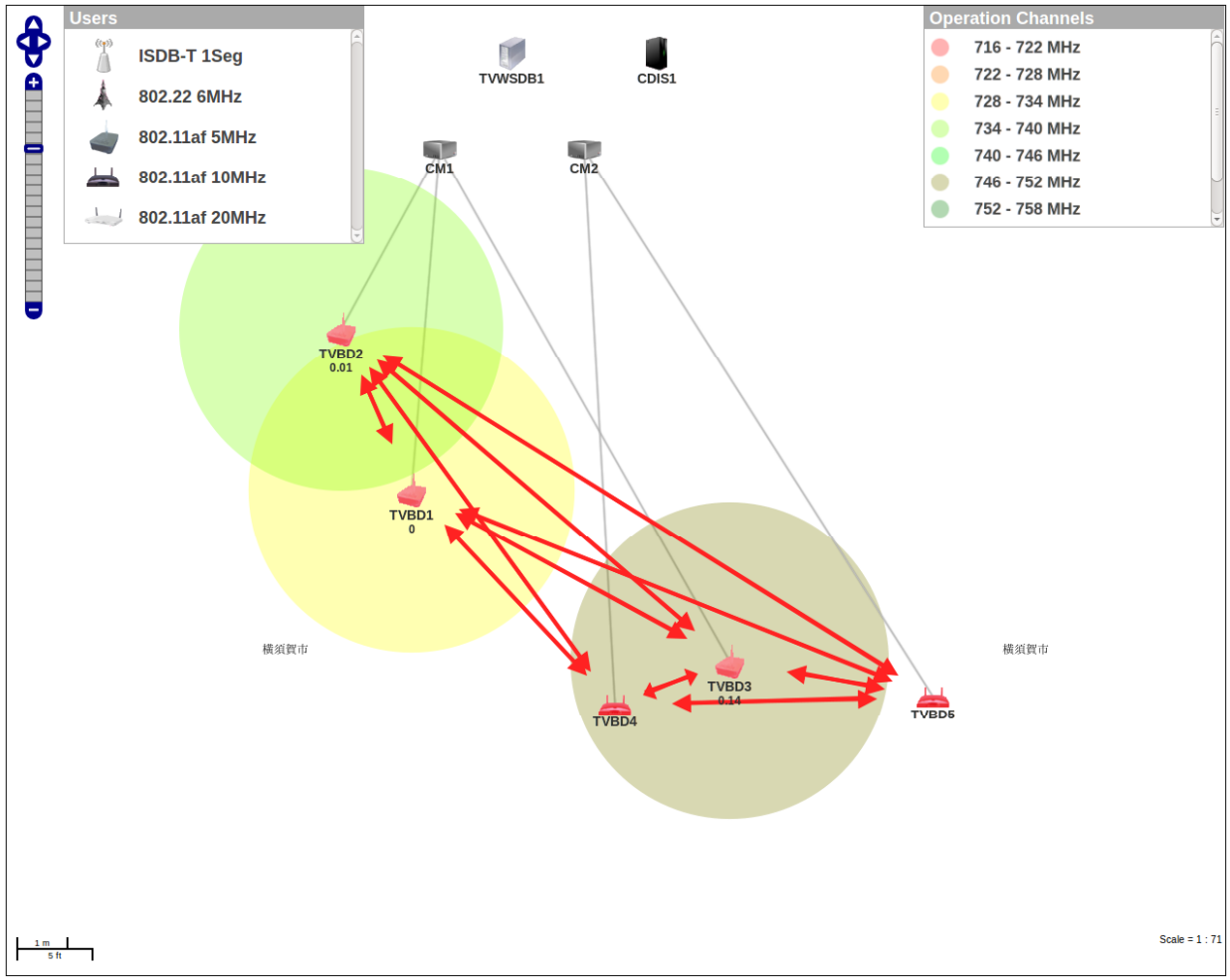

CM1 GUI
CM1
TV WS DB
CM2 GUI
CM2
CDIS
AP2 + CE2
CE2 GUI
AP1 + CE1
STA2
AP3 + CE3
CE1 GUI
STA1
CE3 GUI
STA3
AP4 + CE4
STA5
CE4 GUI
AP5 + CE5
STA4
CE5 GUI

Scenario 2

1. **Access point 1 and station 1 join IEEE 802.19.1 coexistence system and start operation**
2. **Access point 2 and station 2 join IEEE 802.19.1 coexistence system and start operation**
3. **Access point 3 and station 3 join IEEE 802.19.1 coexistence system and start operation**
4. **Access point 4 and station 4 join IEEE 802.19.1 coexistence system and start operation**
5. **Access point 5 and station 5 join IEEE 802.19.1 coexistence system and start operation**

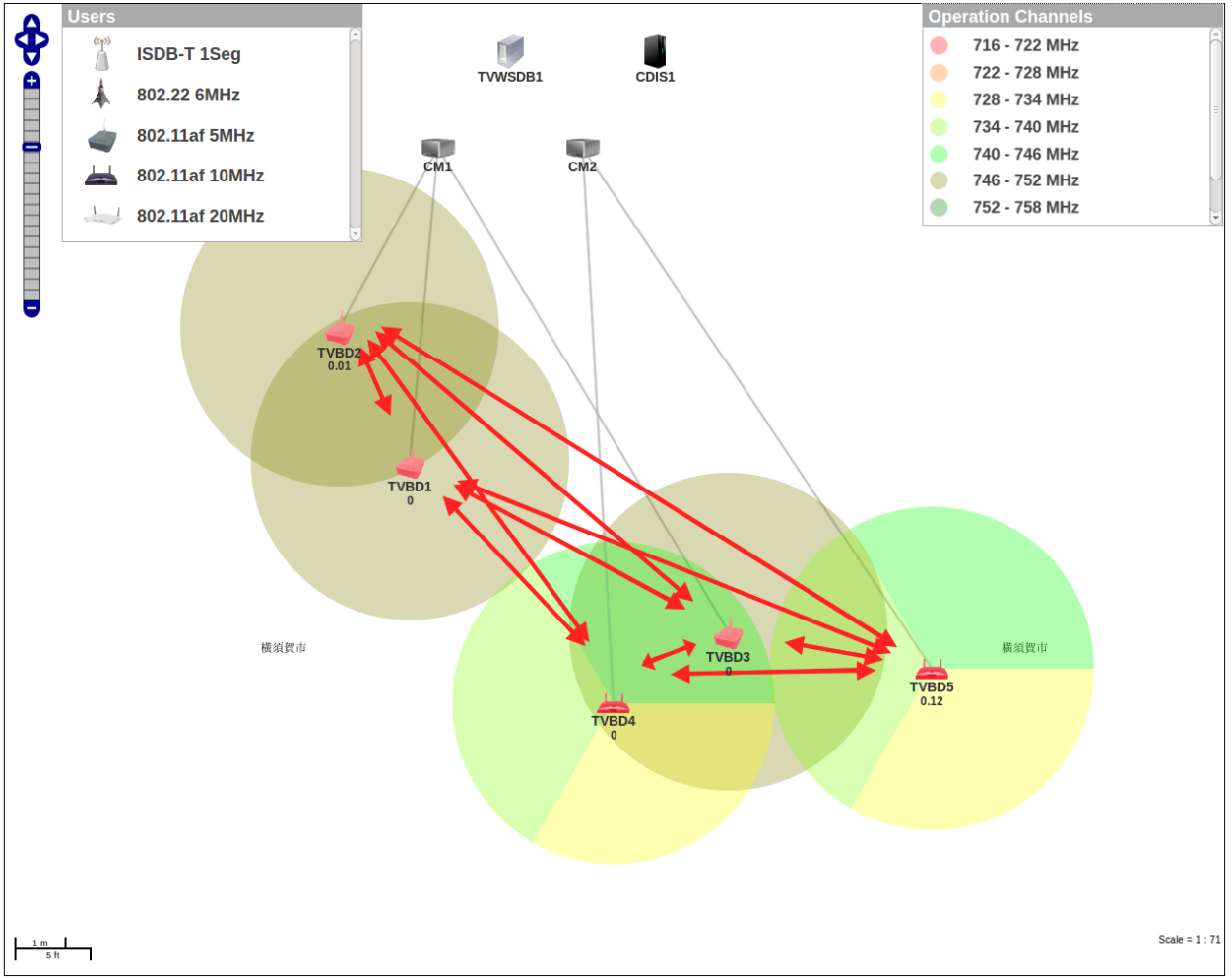
Scenario 2

No CM to CM communication



Scenario 2

CM to CM communication



Conclusions

- **This contribution has presented the results of the feasibility study of the IEEE 802.19.1 TVWS coexistence protocol in different scenarios**
  - Independently operating WSOs
    - 802.11 in TVWS with 5 MHz bandwidth
  - Dissimilar WSOs
    - 802.11 in TVWS with 5 MHz bandwidth
    - 802.11 in TVWS with 10 MHz bandwidth

Conclusions

- **Most of the IEEE 802.19.1 procedures have been implemented and verified including**
  - Authentication
  - Subscription
  - Registration
  - Providing coexistence report and coexistence set information
  - Obtaining available channel list
  - Sharing coexistence set information
  - Measurement
  - Reconfiguration
  - Coexistence set element reconfiguration

Conclusions

- **Most part of the IEEE 802.19.1 reference model has been implemented and verified including**
  - Key part of the COEX_MEDIA_SAP
  - COEX_TR_SAP
    - Entities are remote
    - TCP/IP has been used
  - CXPM driver

Conclusions

- **Both coexistence services have been tested**
  - Information service
  - Management service
- **Both algorithms have been tested**
  - Discovery algorithm
  - Coexistence decision making algorithm
    - Exclusive channel use
    - Sharing with the same type of network