TEMS™ INVESTIGATION

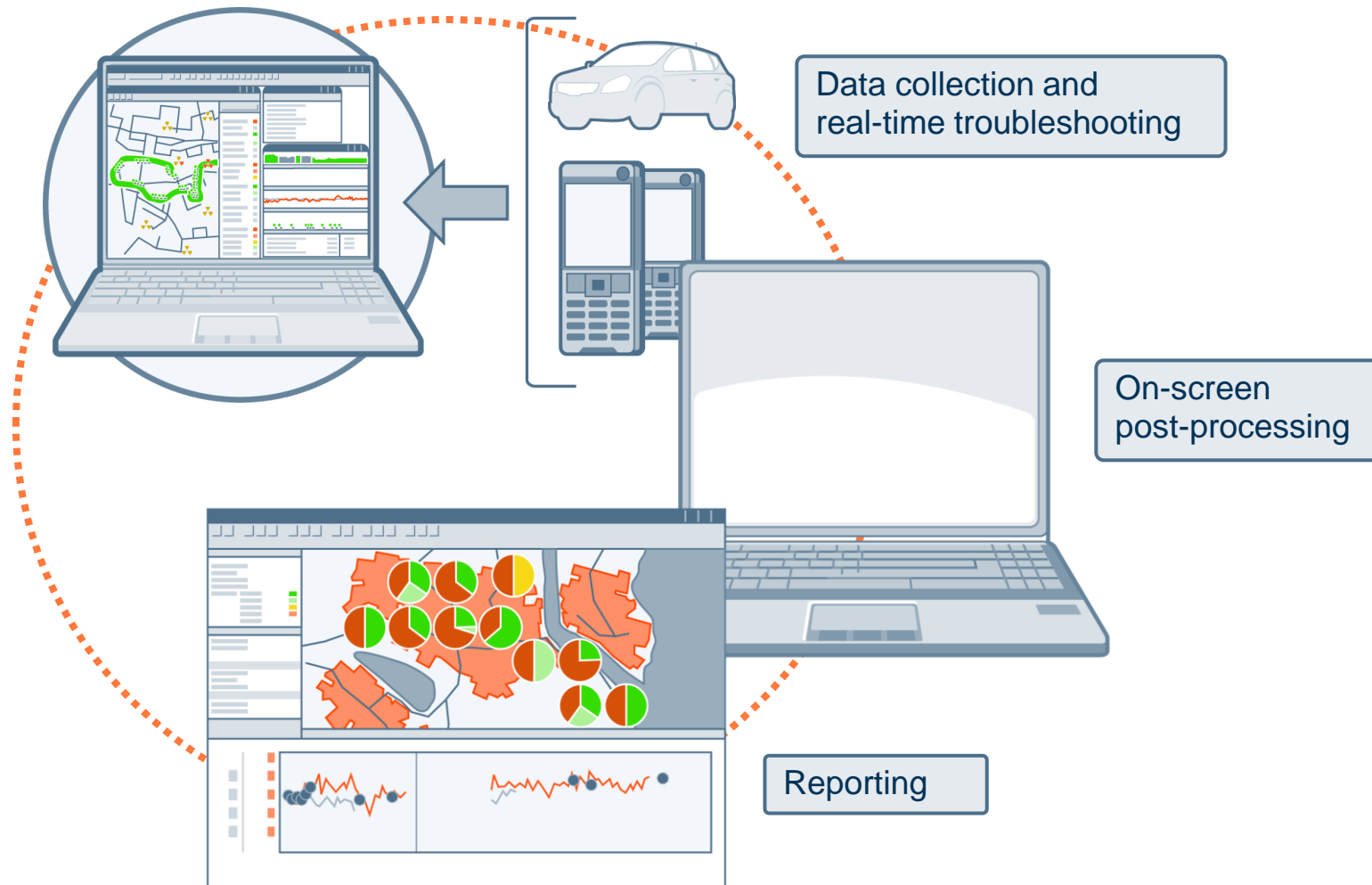# TEMS INVESTIGATION

Module 1: Introduction

Objectives

After completing this module you will be able to:

- Describe the general functionalities of TEMS Investigation
- Understand the different licensing solutions available
- Identify the different devices used in TEMS Investigation

WHAT IS TEMS INVESTIGATION?

Data collection and real-time troubleshooting

On-screen post-processing

Reporting

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SOURCES OF DATA (1/2)

- TEMS Investigation receives information from a number of different sources
  - Phones and UEs
  - Scanners and phone-based scanners
  - PC cards and USB modems
  - AQM module
  - In-building positioning
  - GPS receivers
 - Cell definition files
  - Logfiles

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SOURCES OF DATA (2/2)

- Phones, Scanners, PC cards, USB modems, and Fixed Wireless
- Terminals provides TEMS Investigation with information about the Radio Access Network
  - Connected via USB, serial or Ethernet port*
  - Auto detection of devices
  - Data communication via RAS and NDIS*

- There are differences between devices from different vendors and between models from the same vendor
- The correct device license is required on the license key to connect a specific device
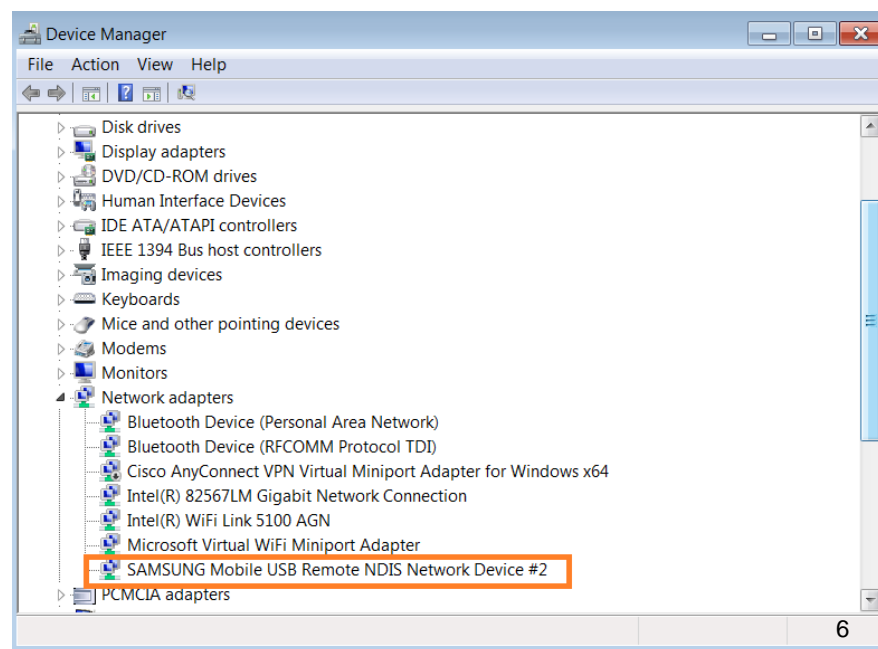
DIFFERENT DEVICES?

TEMS Device:
- Fully temsified = Rooted device
- Extended control capabilities (RAT-, Band-, Cell lock, EVS Codec, CA on/off etc)
- Can have ODM device external connect license for TEMS Investigation
- All ODM standard services are included (FTP, HTTP, Ping, iPerf, Call Control, e)
- Allow digital audio capture to PC (POLQA)
- Social media testing possible (Skype, Twitter, Whatsapp, etc)
- Value argument: Detailed KPI's including IP data, extensive c functions and simplified audio solution
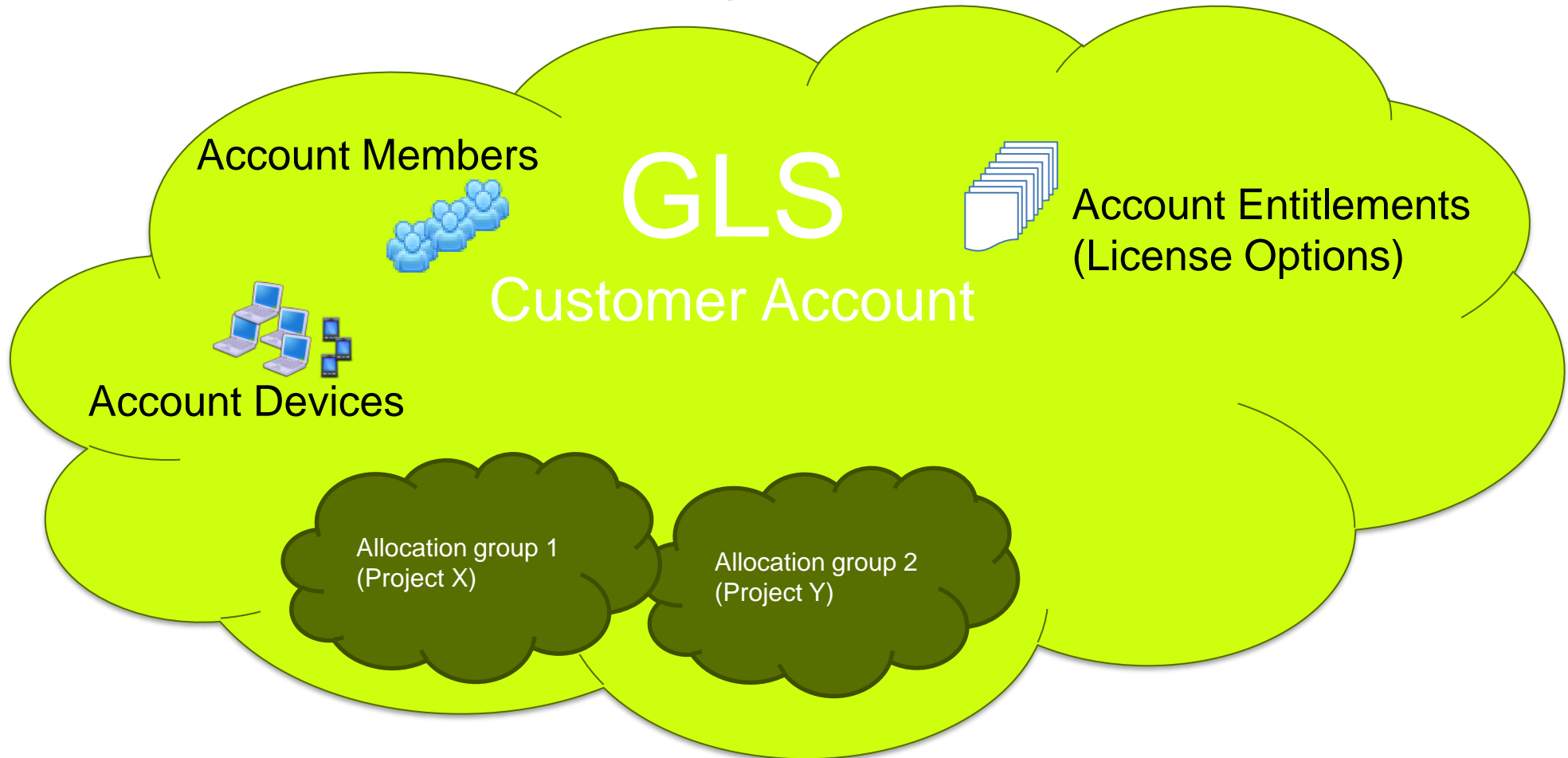
Connectable device:
- Commercial device = Not rooted device, i.e. OTA FW upgradeable
- Basic control functions (RAT-, Band lock)
- Call control included for VoLTE and ACU R2 (POLQA) testing
- Possible to install ODM Call Control / Data for testing (FTP/HTTP and Ping) from TEMS Investigation (no tethering needed)
- Value argument: Test with latest commercial FW for new features like CA combo's or 5G NR updates

Value/Differentiation

TEMS device

Connectable device

in–focus
ALIGN | IMPACT | WIN

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Global License Server - Concept

Account Members

GLS

Customer Account

Account Devices

Account Entitlements
(License Options)

Allocation group 1
(Project X)

Allocation group 2
(Project Y)

INF⬤VISTA

# ODM (On Device Measurement)

- TEMS POCKET

  - Cloud based License

  - ODM Icon running on the phone

  - GLS Based License

- TEMS INVESTIGATION

  - GLS Based License

    - Cloud based License (TEMS Licensing)

    - GLS websites (https://gls.tems.com)

  - ODM Icon running on the phone

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AUTO DETECTION OF EQUIPMENT

- **Auto detection of equipment**
  - Nearly all of the devices that are connectable in TEMS Investigation are detected and enabled automatically
  - Some few devices have to be enabled manually
  - Non-verified equipment can be manually added to the auto detection list via the manual UE configuration utility

- **Devices that have been detected by TEMS Investigation appear in the Equipment Configuration window**
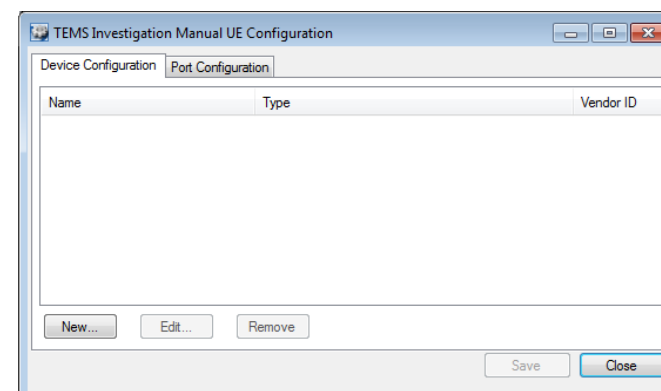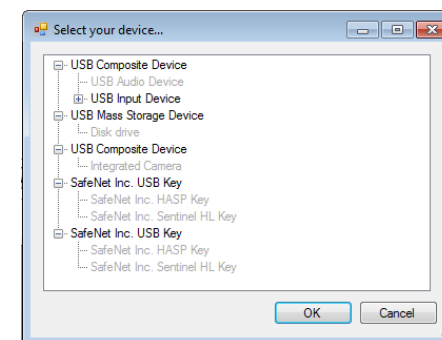
Connect and GO!

TEMS™ INVESTIGATION
Module 2: Software Installation and Recommended Settings

[THE INDUSTRY-LEADING AIR INTERFACE TEST TOOL]

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Objectives

- After completing this module you will be able to:

    - Understand your laptop by using TI Computer Diagnostic.

    - Understand the hardware and software requirements for TEMS Investigation.

    - Install TEMS Investigation.

    - Understand the license update process.

    - Review your license contents.

    - Run TEMS Investigation.

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PC Software Requirements

The following operating systems are supported:
- Windows 11
- Windows 10
- Windows 8 Pro

All the latest Windows updates should always be installed.
Supported languages are English (U.S.), Chinese (simplified characters), and Japanese.
For all devices that are to be connected to the PC, be sure to use the drivers appropriate to the PC operating system. See the Device Configuration Guide.

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Installing TEMS Investigation

The installation is done by running the file TEMSInvestigation.exe.

•You must have administrator rights on the PC to be able to install TEMS Investigation.

•Also please note that the PC must have a working Internet connection when executing the EXE file, since various software components will be retrieved over the Internet. This includes Microsoft .NET 4.5 in case the PC does not already have it installed. If Microsoft .NET 4.5 needs to be installed, the entire installation procedure may take up to 10–20 minutes to complete. [Kindly use the full dotnetfx4.5 SW] *File : dotnetfx45_full_x86_x64.exe*

On some PCs, a reboot may take place after the .NET Framework installation.

By default, TEMS Investigation will be installed to the directory C:\Program Files\TEMS Investigation XX.

** Please ensure your laptop is 32 bit or 64 bit. If the laptop does not work, reinstall the Microsoft C++ vcredist_x64.exe or vcredist_x84.exe software

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Installing Device Drivers (ASUS Qualcomm)

• USB drivers are provided for all user terminals that can be purchased withTEMS Investigation, as well as for many other For certain user terminals, however, drivers must be obtained from the suppliers.

• Install Qualcomm USB Driver
- Download and extract the Qualcomm driver package on the computer.
  Download in this link >> https://xiaomidriver.com/install-qualcomm-driver
- Once the driver package is extracted, you will be able to see the Qualcomm USB Driver V1.0.exe file
- Double-Click on the Qualcomm USB Driver v1.0.exe file launch the Setup window
- Click on the Next button
- Click on the Next button
- Click on the I accept terms Checkbox and then Click on the Next button
- Click on the Install button to begin the installation
- Driver installation will take a few seconds to complete
- Once the installation is completed, click on the Finish button to Close the Setup Window

Automatic Check for TEMS Investigation Software Updates

▪If the PC has an Internet connection, and you are an admin user on the machine, the TEMS Investigation Launcher will automatically check an Infovista server for updates to TEMS Investigation and some other Infovista software. If there are updates available, they will be listed in this window:

Update available

Updates are available for the following applications

Update	Application	Local version	Remote version	
☐	On-device 2	2.6	2.7	

Update   Close   16

TEMS™ INVESTIGATION
TEMS Investigation User Interface

[THE INDUSTRY-LEADING AIR INTERFACE TEST TOOL]

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Objectives

■ After completing this module, you will be able to:

- Understand the user modes of TEMS Investigation.

- Describe the TEMS Investigation user interface.

- Use predefined workspaces and configure new ones.

- Load maps into your workspace.

- Load cell files into your workspace.

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TEMS Investigation User Modes

- TEMS Investigation can be run in two different modes:

    - *Drive testing mode:* Information presented on the screen is obtained from devices connected to the PC and activated in TEMS Investigation. New logfiles can be recorded in this mode.

    - *Analysis mode:* Information presented on the screen is read from a logfile. This mode is used for inspection and analysis. *Previously it is called Replay Mode*

    - User modes are mutually exclusive.

![infovista]

TEMS Investigation User Interface

- Workspace
- Worksheets
- Navigator
- Toolbars
- Menu Bar
- Status Bar

![infovista]
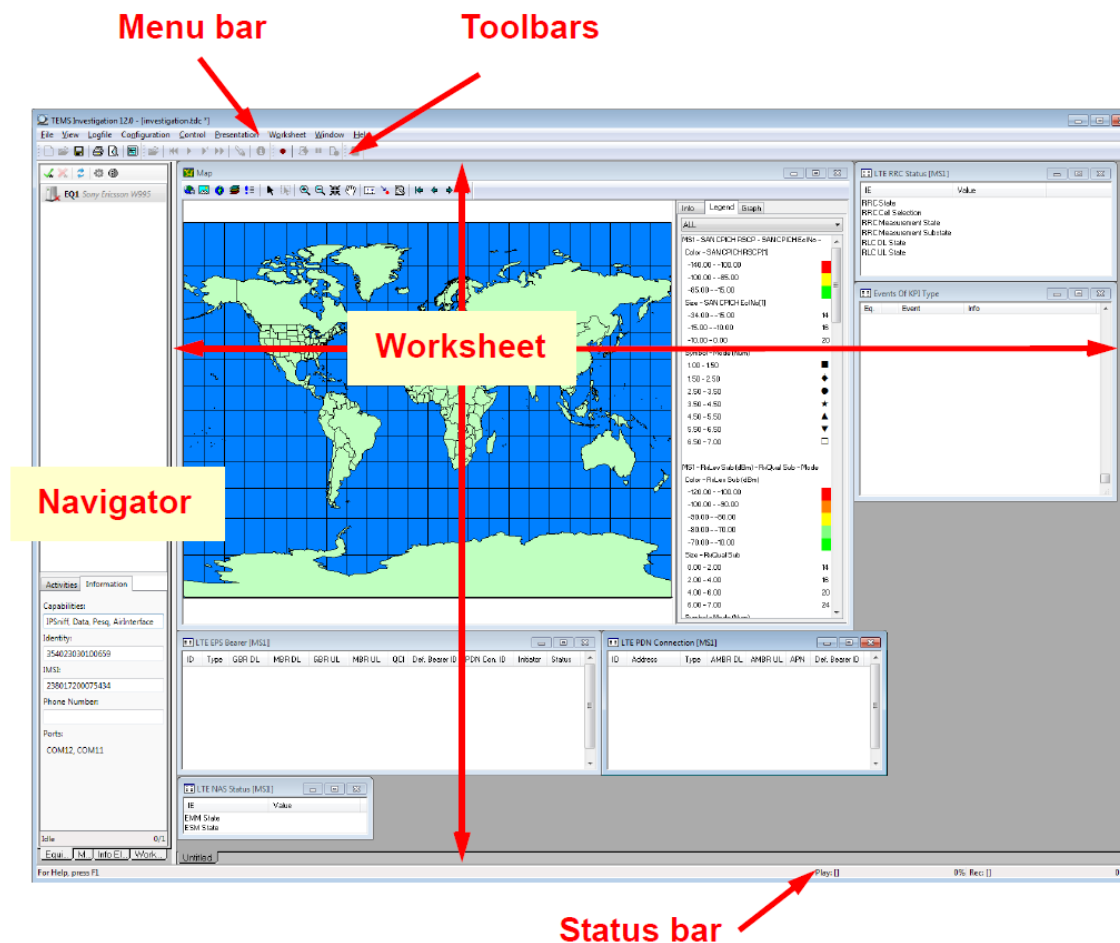
Workspaces and Worksheets

- Workspace is the entity that stores all windows and settings used in a working session.

  - Only one workspace open at a time.

  - Handled from *File and View* toolbar or *File* menu.

- Worksheets are divisions of the workspace to manage windows more smoothly.

  - Up to ten worksheets can be active simultaneously.

  - Handled from the *Worksheet* menu
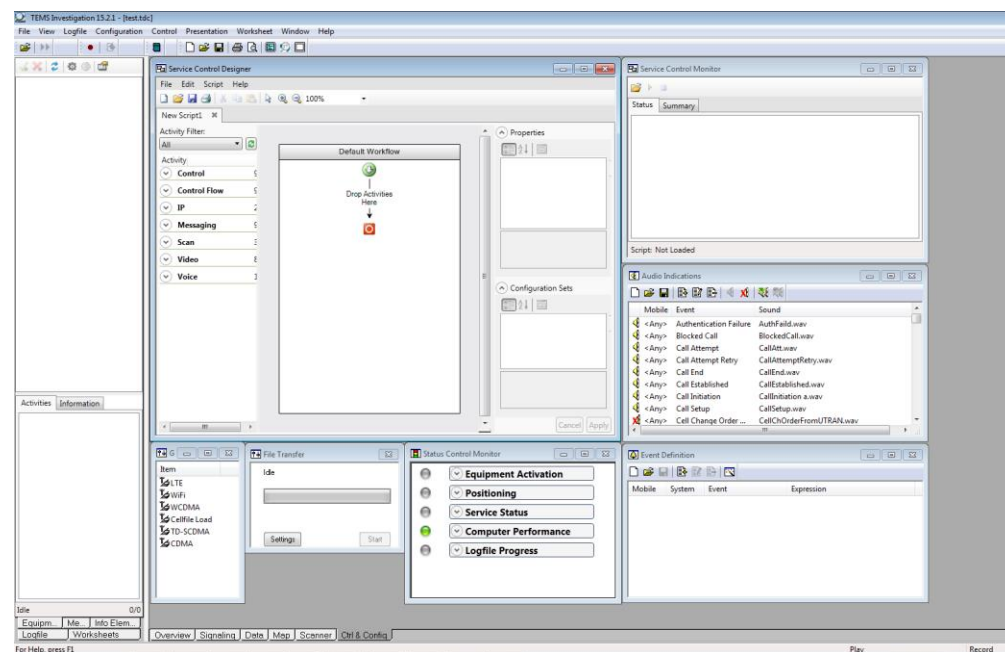
Navigator

- Allows to setup and manage your workspace and external equipment.

- It has the following tabs:
  - Equipment tab.
  - Menu tab.
  - Info Element tab.
  - Worksheets tab.
  - **Logfile tab.**

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Logfile Tab Under Navigator (1/2)

Logfile Tab Under Navigator (2/2)

Presentation Windows

- Line Charts

- Bar Charts

- Status Windows

- Message Windows

- Event Counter windows

- Map

Control Windows

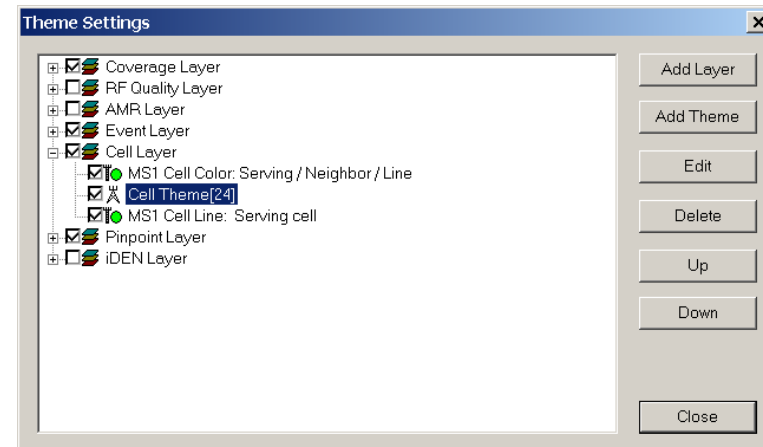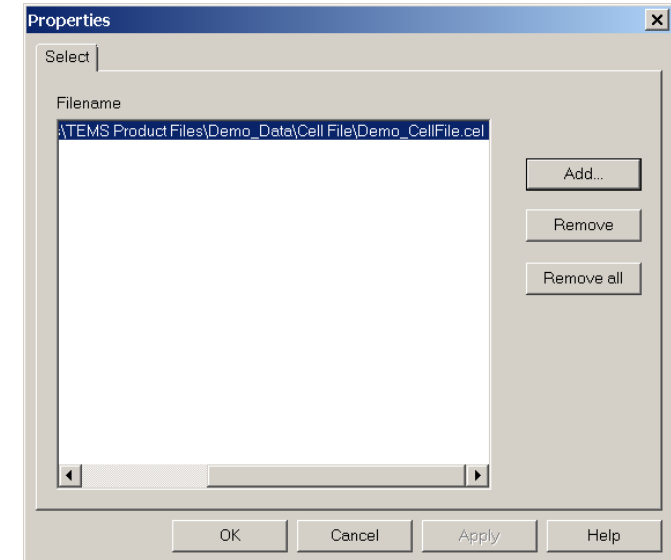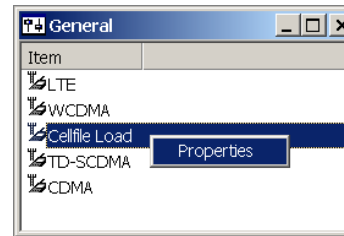- Service Control Designer
- Service Control Monitor
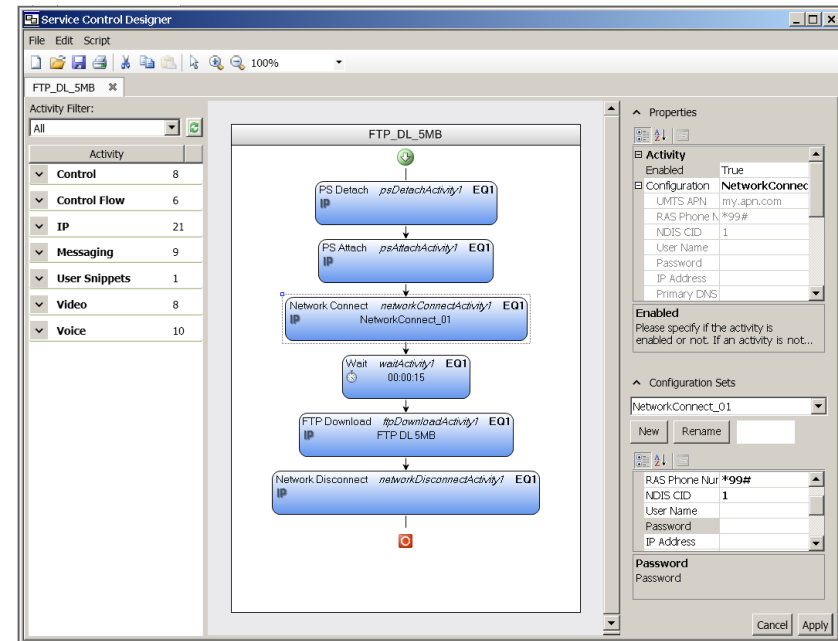
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Loading Maps

- A GeoSet is a special type of workspace used for map layers.

- GeoSets are constructed using the GeoSet Manager.

- TAB files are used to construct a GeoSet.

- Once the GeoSet is created it can be opened as a map in the Map Window.

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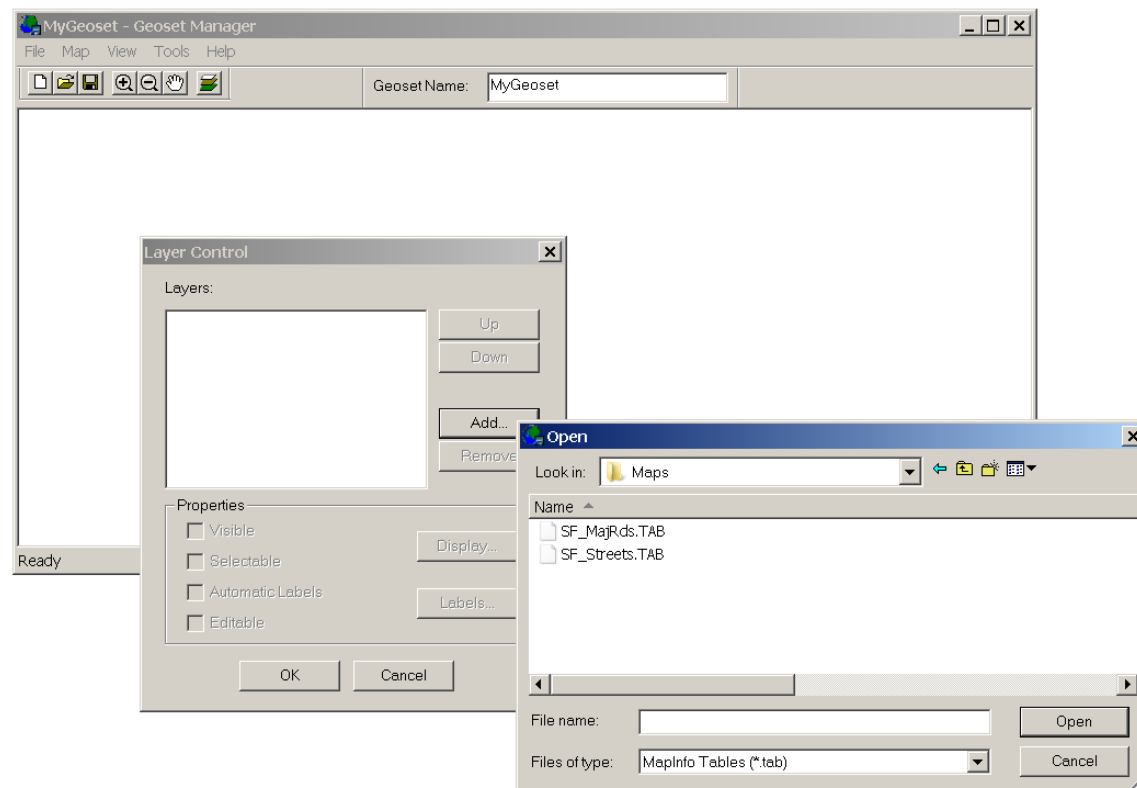
Loading Cell Files

- **Cell Files**
    - Text format (.cel)*
    - XML format (.xml)
- **Load cell files using the General Window**
- **Add Cell Layer Themes in the Map Window**
    - Cell Theme
    - Cell Line Theme
    - Cell Color Theme

* GSM and UMTS only

Properties

Select

Filename

\TEMS Product Files\Demo_Data\Cell File\Demo_CellFile.cel

Add...
Remove
Remove all

OK   Cancel   Apply   Help

General

Item
- LTE
- WCDMA
- Cellfile Load   Properties
- TD-SCDMA
- CDMA

Theme Settings

- ☑ Coverage Layer
- ☐ RF Quality Layer
- ☐ AMR Layer
- ☑ Event Layer
- ☑ Cell Layer
    - ☑ MS1 Cell Color: Serving / Neighbor / Line
    - ☑ Cell Theme[24]
    - ☑ MS1 Cell Line: Serving cell
- ☑ Pinpoint Layer
- ☐ iDEN Layer

Add Layer
Add Theme
Edit
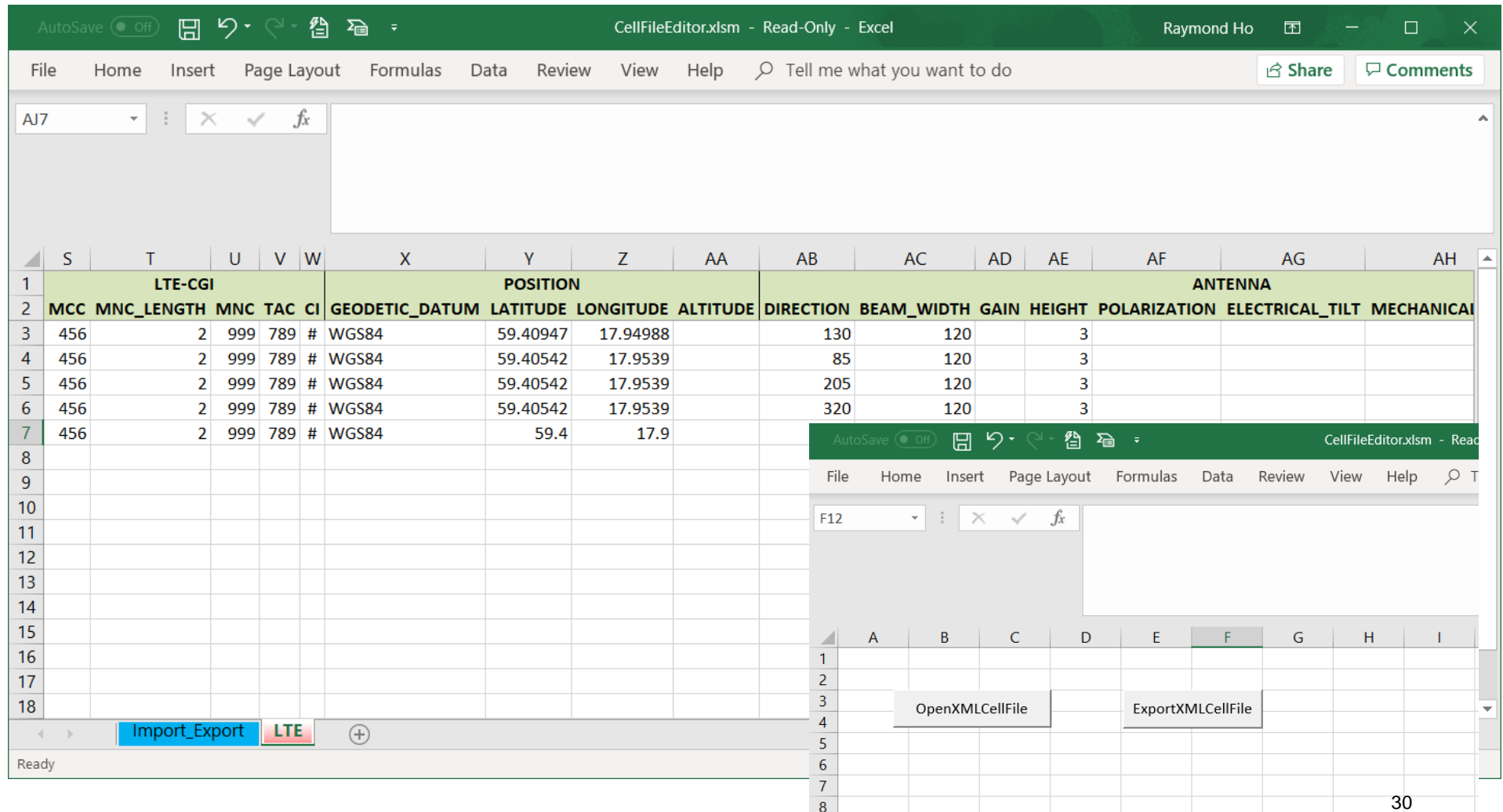Delete
Up
Down

Close

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Cell Files

- Cell Files
  - Text format (.cel)*
  - XML format (.xml)

- Cell file editor
  - C:\Program Files (x86)\TEMS\TEMS Investigation 21.x\XML Schema

Microsoft Excel
ro-Enabled Works|

Import from XLS or CSV and export to Tems XML

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Pinpoint Window

- Using IBWave Technology

- Pinpointing can be

  1. Manual

  2. Predefined
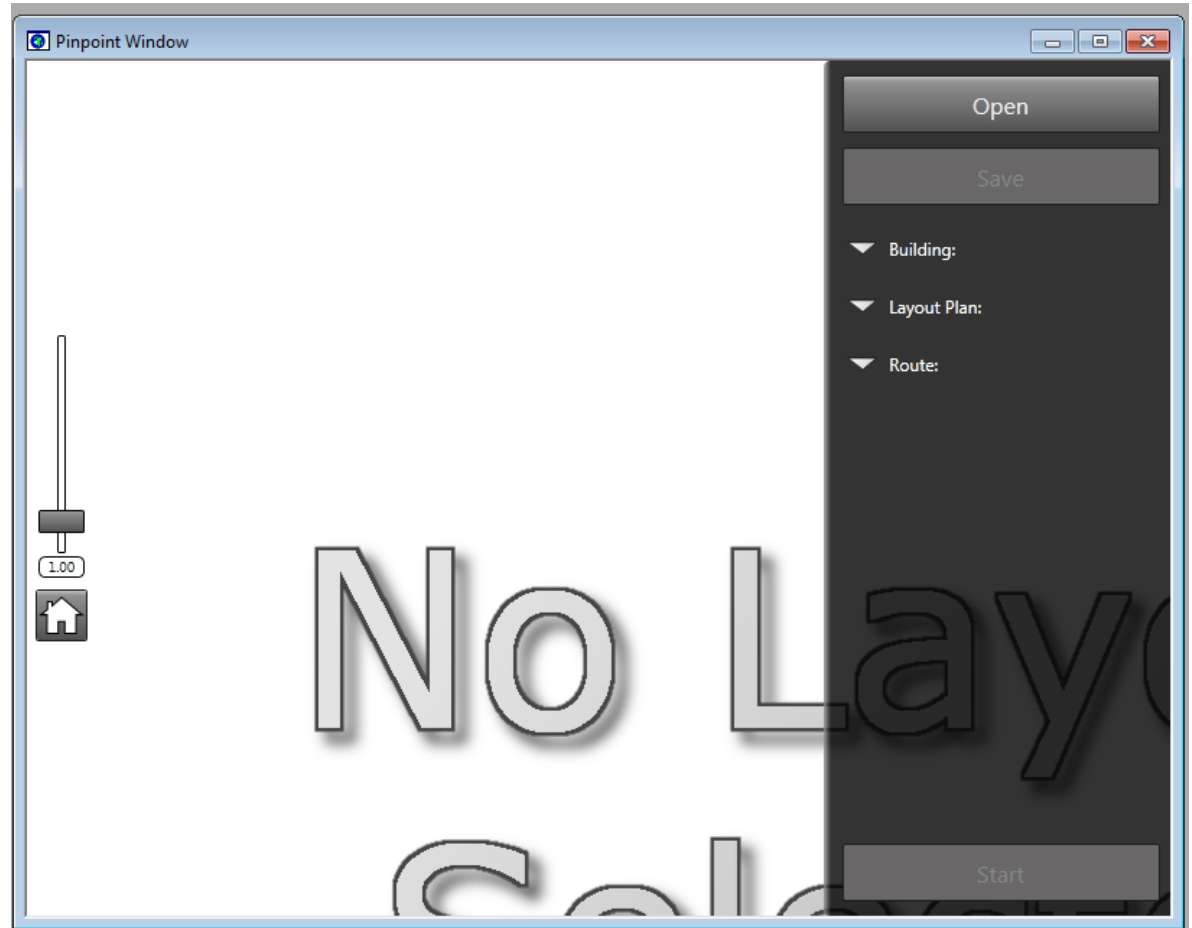
TEMS™ INVESTIGATION
Module 4: Connecting Equipment

[THE INDUSTRY-LEADING AIR INTERFACE TEST TOOL]

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Objectives

- After completing this module you will be able to:

  - Activate/deactive equipment in TEMS Investigation.

  - Manually run services and apply control functions.

  - View and modify certain properties of devices.

  - Use the Manual UE Configuration utility.

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How to detect ASUS phones

- USB Debugging ON
   - Settings – Developer Options
    - Check USB Debugging

Equipment tab of the Navigator

- External devices are automatically detected and listed in the top pane of the Navigator's Equipment tab.

- Each device is represented by a number "EQ" item.

- You need to activate a device before you can use it for data collection.

- Activate/Deactivate a detected device from its context menu (right-clicking it).

- Activate/Deactivate all devices clicking the Activate All/Deactivate All buttons on the Equipment tab toolbar.

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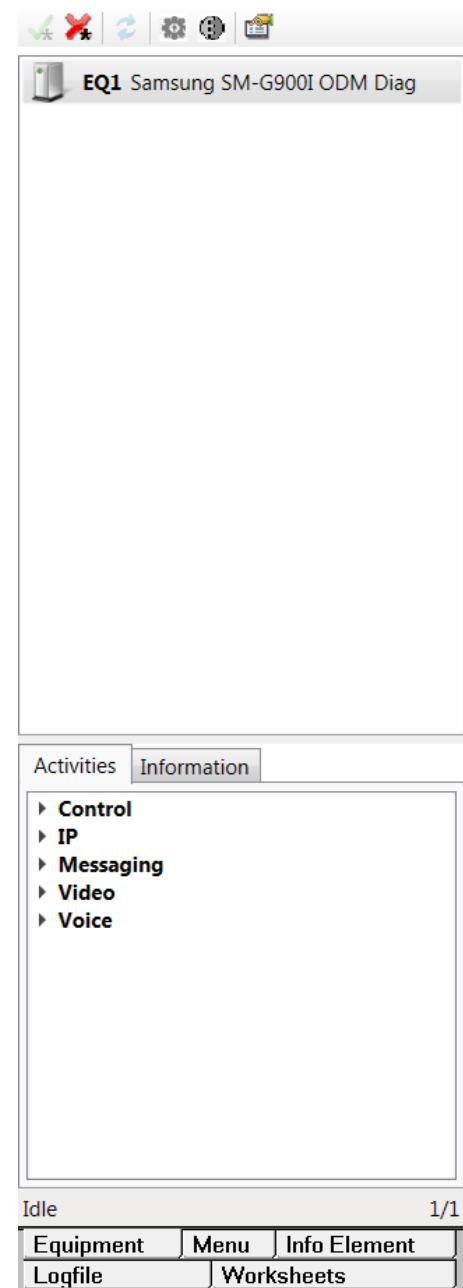
# Running services and applying control functions manually

- Manually run services on a device from the Activities subtab.

- Manually apply control functions to a device.

- Right-click specific activity to enable context menu, then select activity and associated Configuration Set where required.

- A Configuration Set defines settings for a particular activity.

- Configuration Sets created here can later be used for scripts.
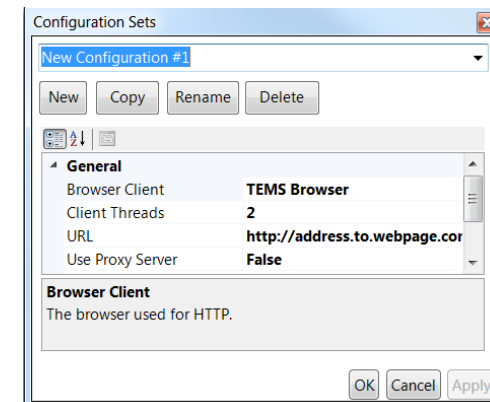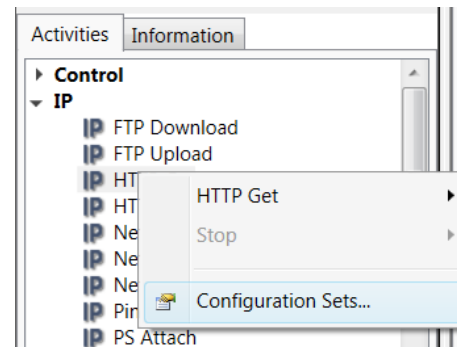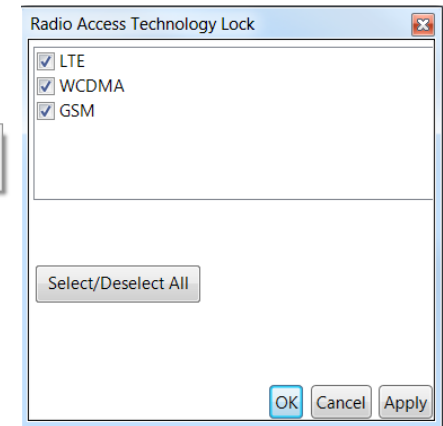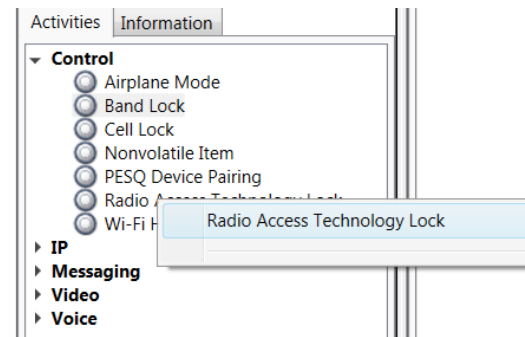
Equipment Properties

- You can view and modify certain properties of devices from TEMS Investigation.

- Device properties vary by phone model.

- Right-click the device in the top pane of Navigator's Equipment tab and select "Properties…"

- Click Apply after changing properties for changes to take effect.
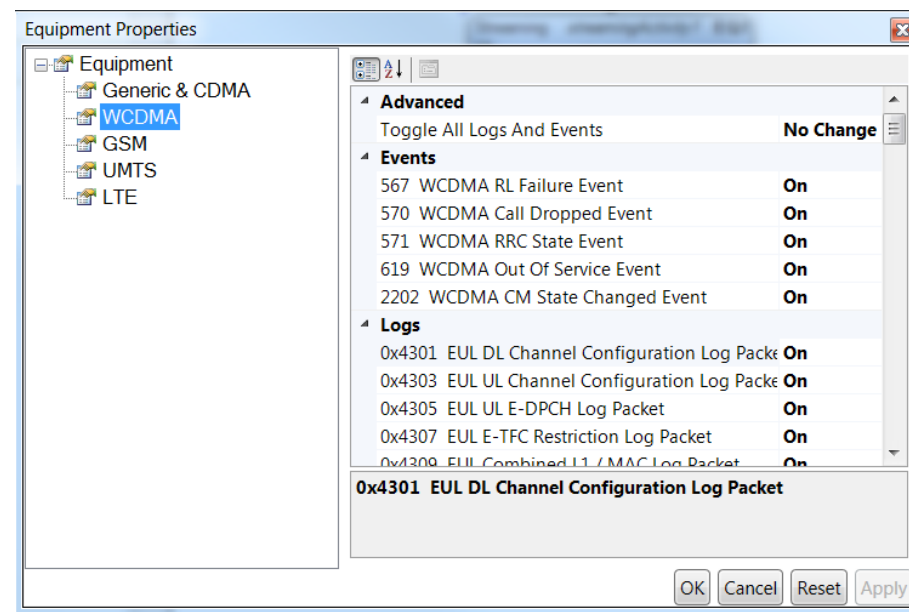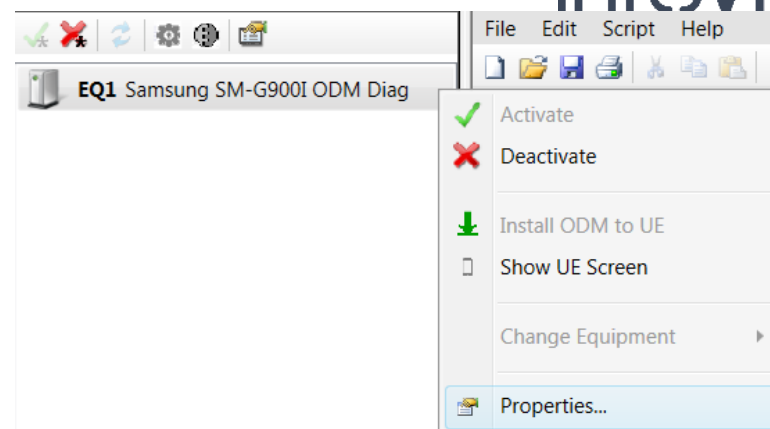
TEMS™ INVESTIGATION

## Module 5: Service Control Designer and Service Control Monitor

[THE INDUSTRY-LEADING AIR INTERFACE TEST TOOL]

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Objectives

- After completing this module you will be able to:

    - Understand how to compose and configure scripts.

    - Understand how to validate and run scripts.

   - Understand how to save and load scripts and snippets.

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The Service Control Designer

- The Service Control Designer window is used to compose service control workflows (scripts).

- Panes:
    - Activity pane
    - Workflow pane
    - Properties pane
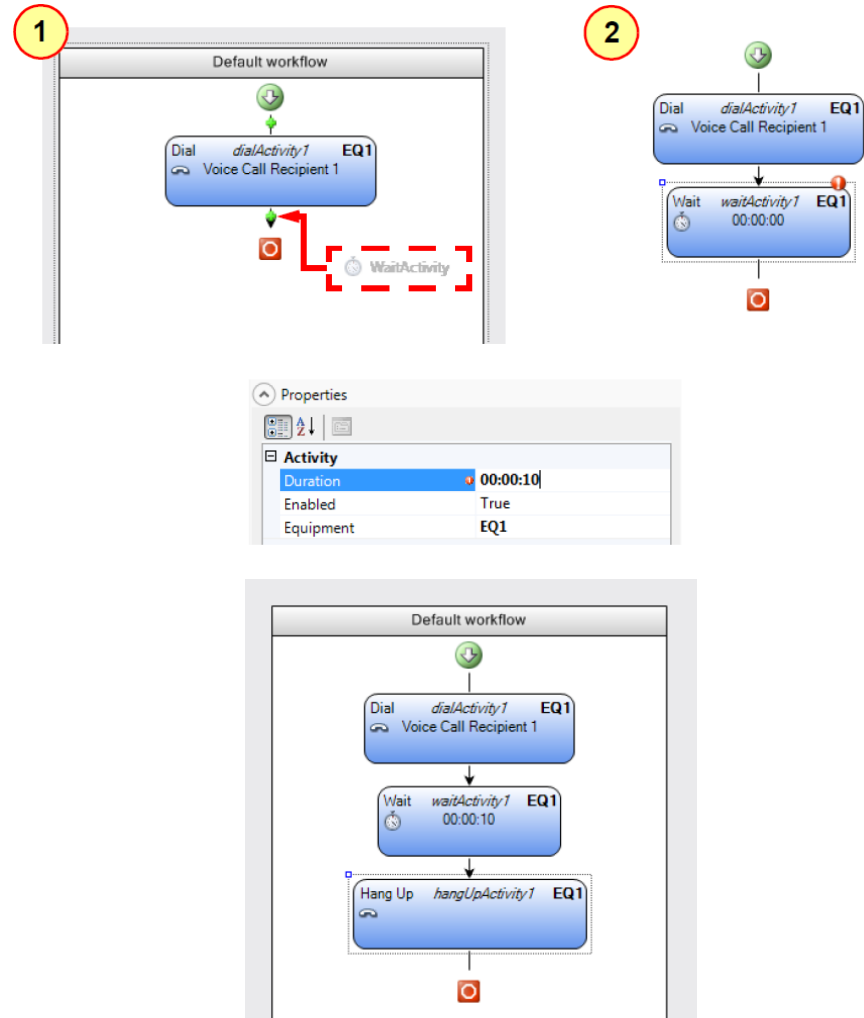   - Configuration Sets pane

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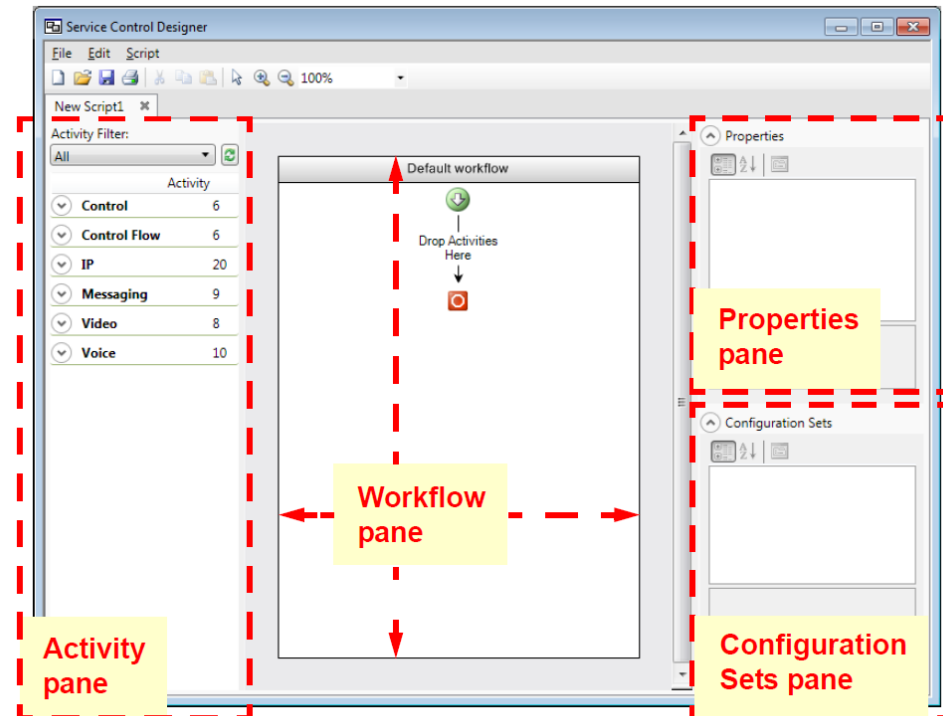
Composing and configuring scripts (1/13)

- Script that dials single voice calls.
    - Add voice call activity to the script.
    - Dial box and Properties pane are tagged with exclamation mark, activity is not properly configured yet.
    - Define a configuration set for the Dial activity in the Configuration Sets pane.
    - Properties and Workflow panes are updated with the configuration data.
   - To specify duration of the call we use the Wait activity.

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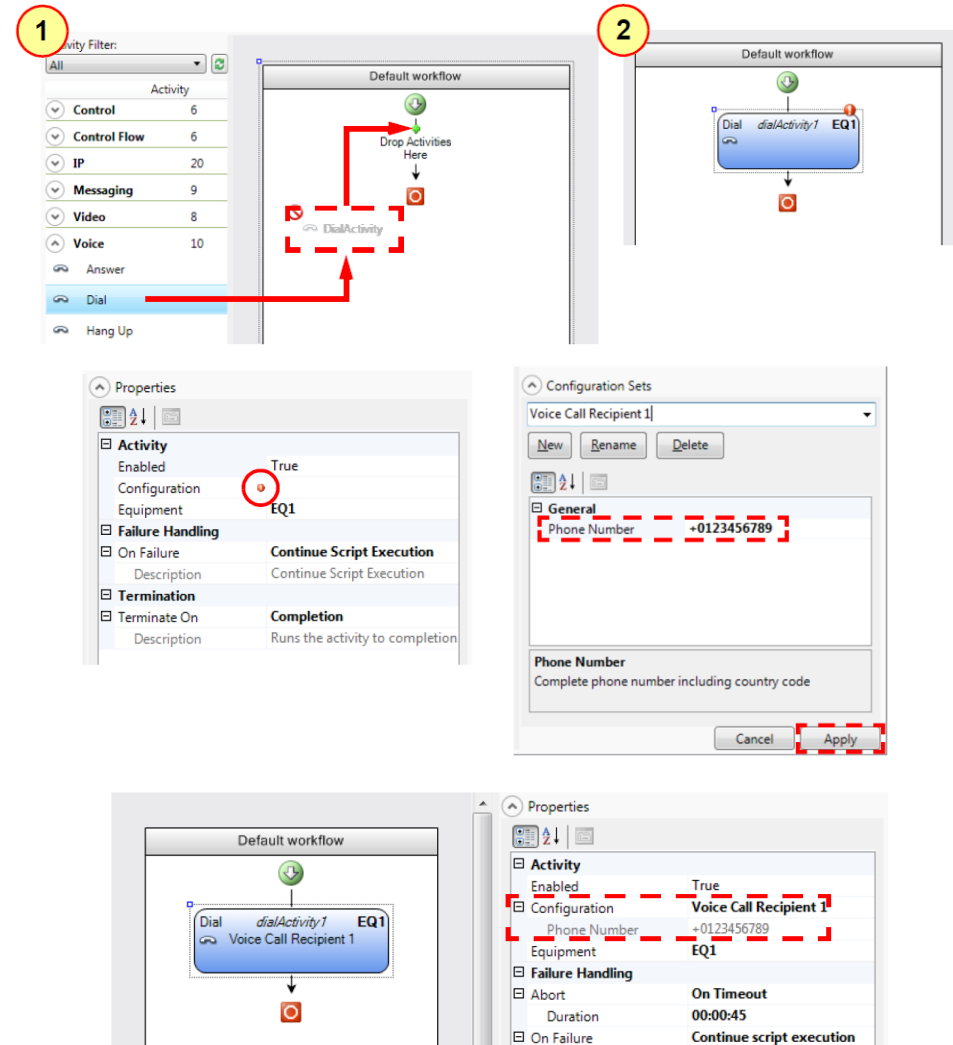
Composing and configuring scripts (2/13)

- Drag the Wait activity just below the voice dial box.

- Set the duration in the Properties pane.

- Add the Hang Up activity after the wait.

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Composing and configuring scripts (3/13)

- **Setting Up a Network Connection**
  - Add Network Connect activity to the script.
  - Exclamation marks indicate that configuration is missing.
  - Define a configuration set for the Network Connect activity.
  - Select the configuration set in the Properties pane

43

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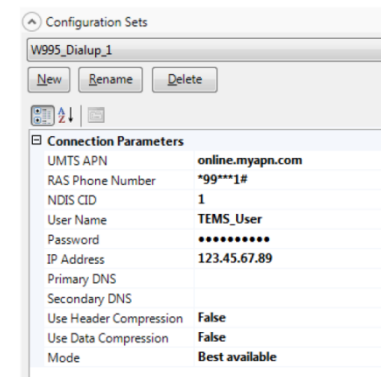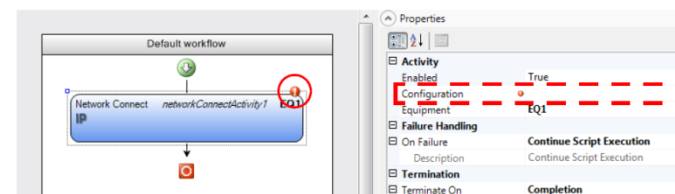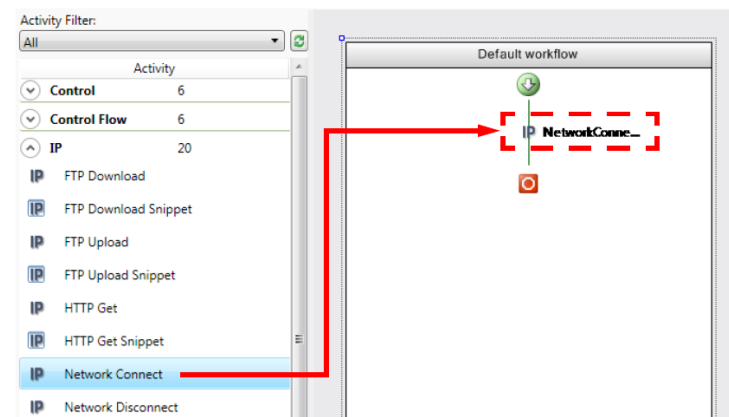
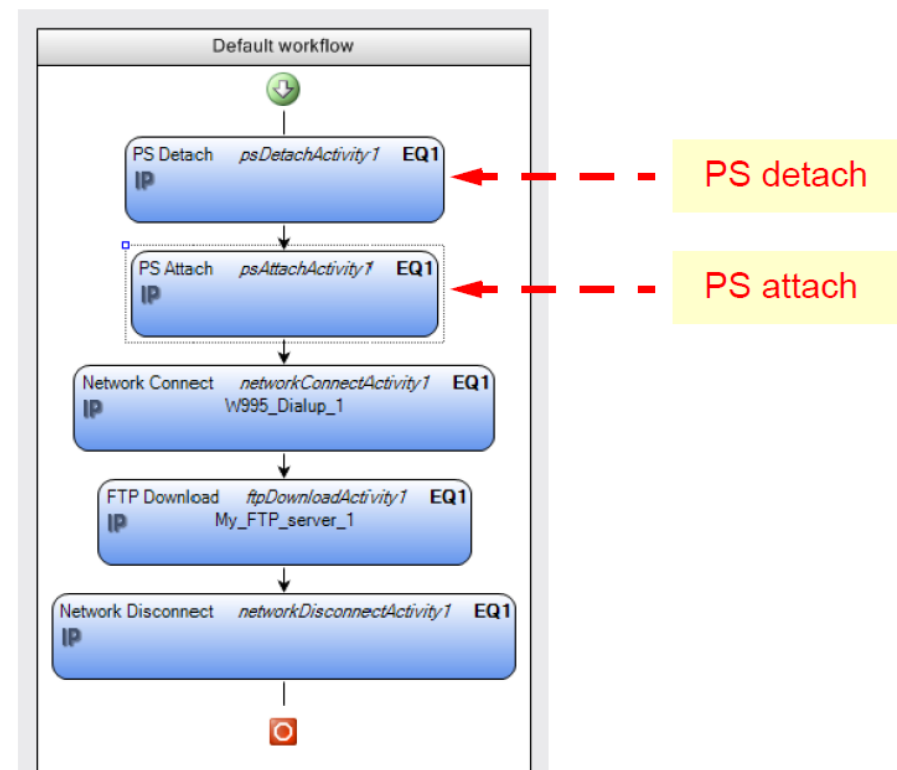# Composing and configuring scripts (4/13)

- **Setting Up a Data Service activity (FTP download)**

  - Add a Network Connect activity and associate it with an existing configuration set

  - Then add a Network Disconnect activity at the bottom of the workflow.

  - Insert an FTP Download activity between the network connect and disconnect.

  - Define a configuration set for the FTP Download activity and select it in the Properties pane.


44

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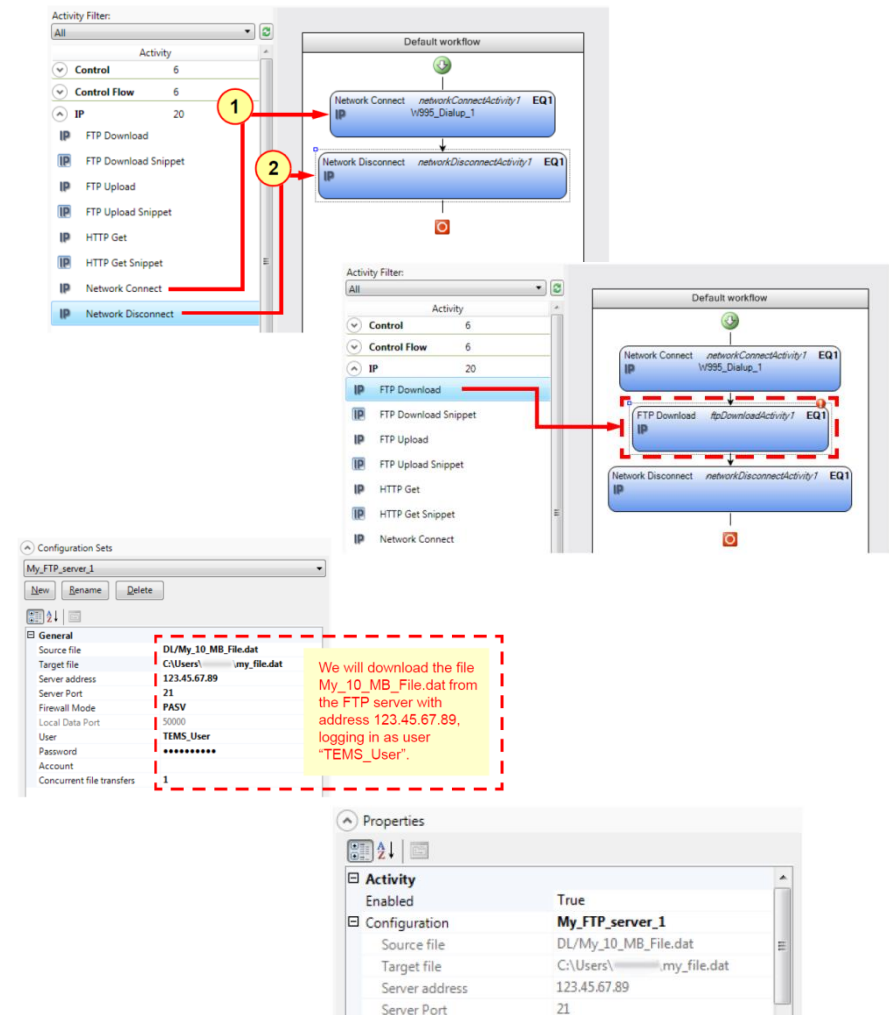
Composing and configuring scripts (5/13)

- Explicit PS attach and detach operations.
    - To measure the time taken by these operations for the purpose of computing KPIs.
    - Add a PS Detach and a PS Attach activity in that order at the beginning of a workflow.

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Composing and configuring scripts (6/13)

- Snippets.
    - A snippet is fixed sequence of activities defined as a building block.
    - Can be reused, saving time and effort creating new scripts.
    - Predefined snippets for all supported services are provided.
    - Predefined snippets are tailored to produce all data required for KPI computation.
    - An arbitrary activity sequence can also be saved as a user-defined snippet.

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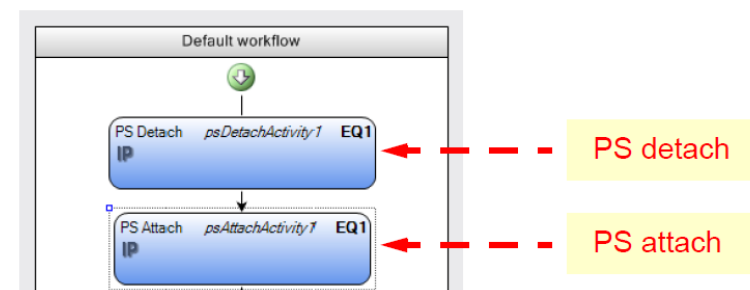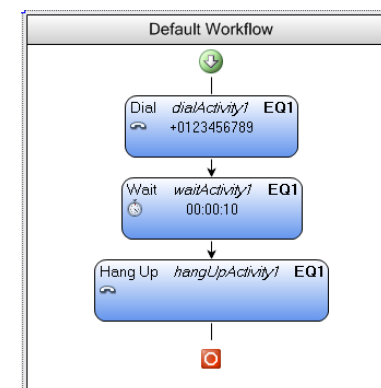
Composing and configuring scripts (7/13)

- **Activity properties that control execution.**

  - **On Failure: Determines what happens if an activity fails.**

  - **Abort: Used to abort an activity after a fixed length of time or if a particular event occurs.**

⊟ **Failure Handling**	
⊟ On Failure	**Retry**
Retries	**3**
On Failure	**Continue script execution**
Delay	**00:00:05**
⊟ Abort	**Disabled**
Description	Runs the activity to completi

⊟ **Failure Handling**	
⊟ On Failure	**Stop script execution**
Description	Stop script execution
⊟ Abort	**Disabled**
Description	Runs the activity to completi

⊟ **Failure Handling**	
⊟ On Failure	**Retry**
Retries	**3**
On Failure	**Continue script execution**
Delay	**00:00:05**
⊟ Abort	**On Timeout**
Duration	**00:00:45**

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Composing and configuring scripts (8/13)

- Sequence Activity.
    - Defines a sequence of activities as a unit, allowing it to be treated as such.
    - This activity has no unique properties.

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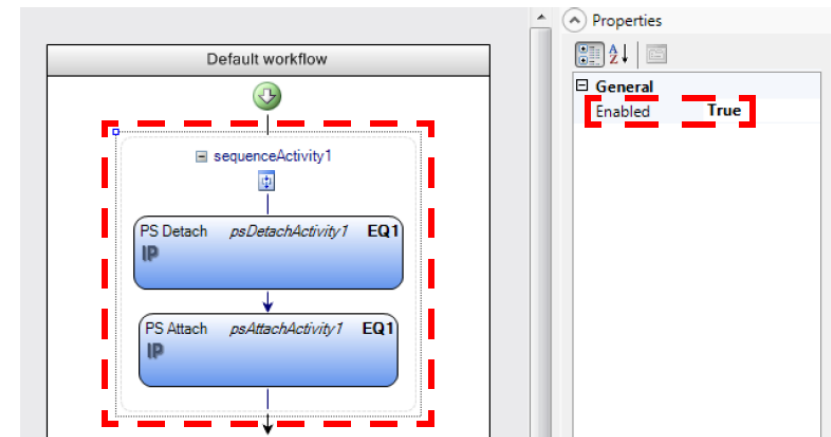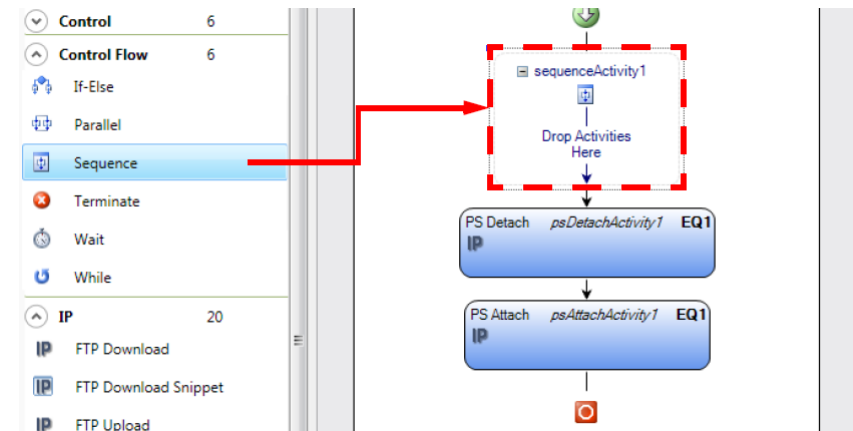
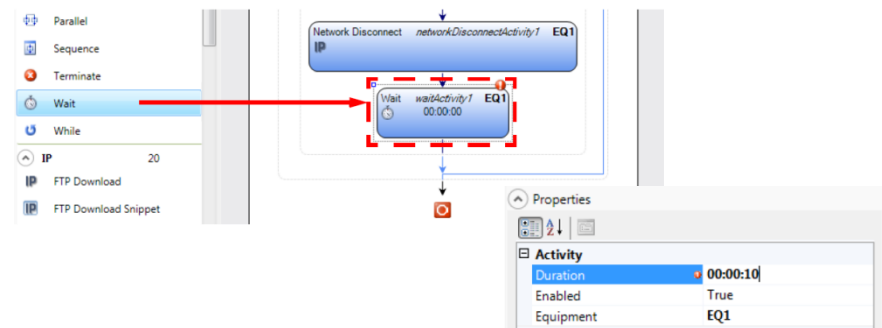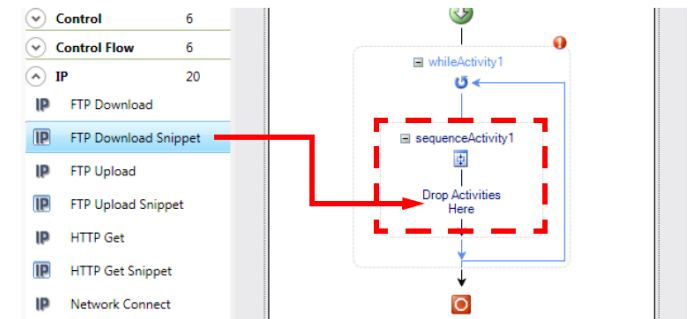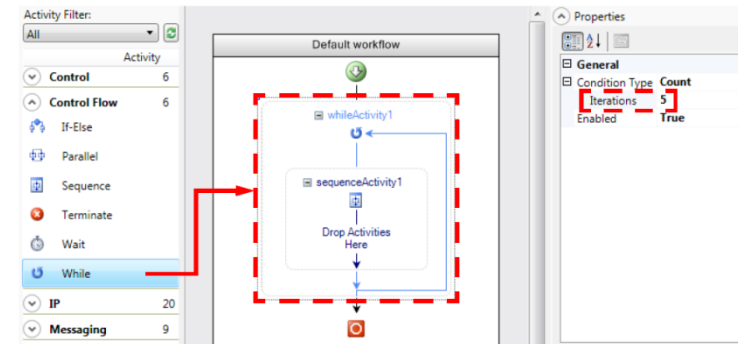# Composing and configuring scripts (9/13)

- **If-Else Activity.**
  - Used to split the execution flow into several branches based on outcome of previous activity.
  - Evaluation of conditions proceeds from left to right.
 - Each branch is constituted by an "if-else branch" activity.
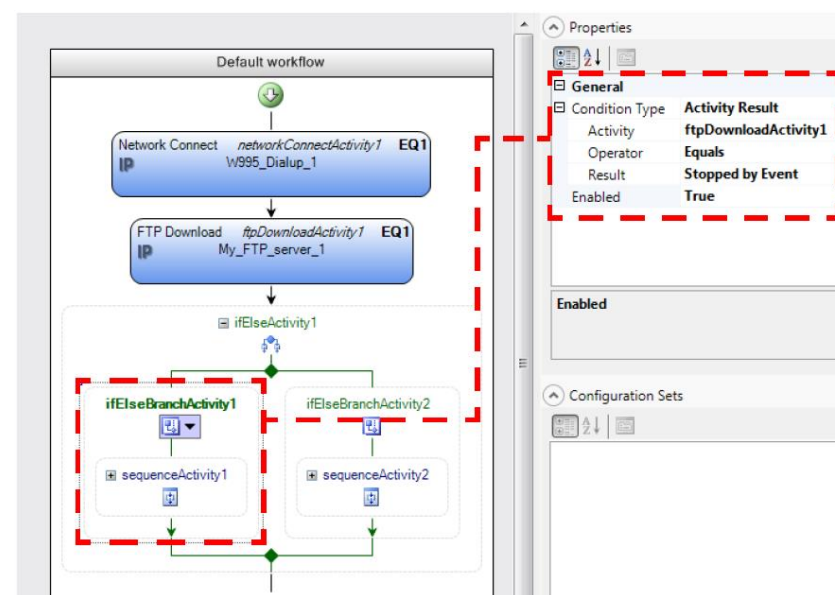
Composing and configuring scripts (10/13)

- While Activity.

    - Used to repeat a sequence of activities a predetermined number of times.

   - While loops can be nested arbitrarily.

50

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Composing and configuring scripts (11/13)

- Wait Activity.
  - The function depends on its position in the workflow.
  - Following a Dial or Video Dial activity, gives duration to the call.
  - Appearing elsewhere, it temporarily suspends the execution of the workflow branch where it is located.
  - The Duration property governs how long to wait.

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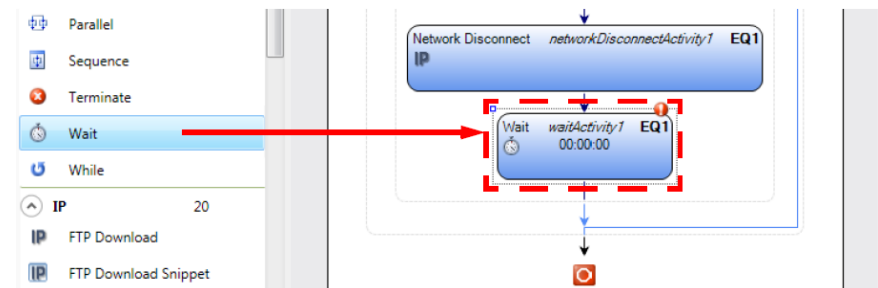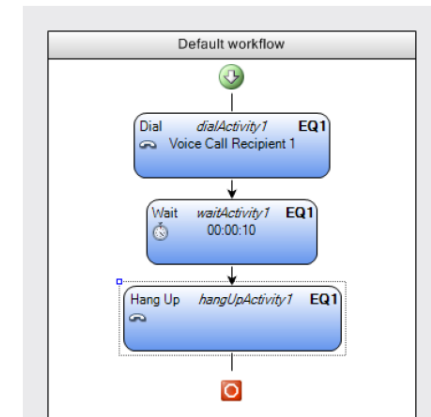
Composing and configuring scripts (12/13)

- Parallel Activity.

  - Causes the workflow to split unconditionally into two or more branches (no hard limit).

  - Each branch must involve different devices.

  - Each parallel branch is encapsulated within a Sequence activity.

 - This activity has no unique properties.
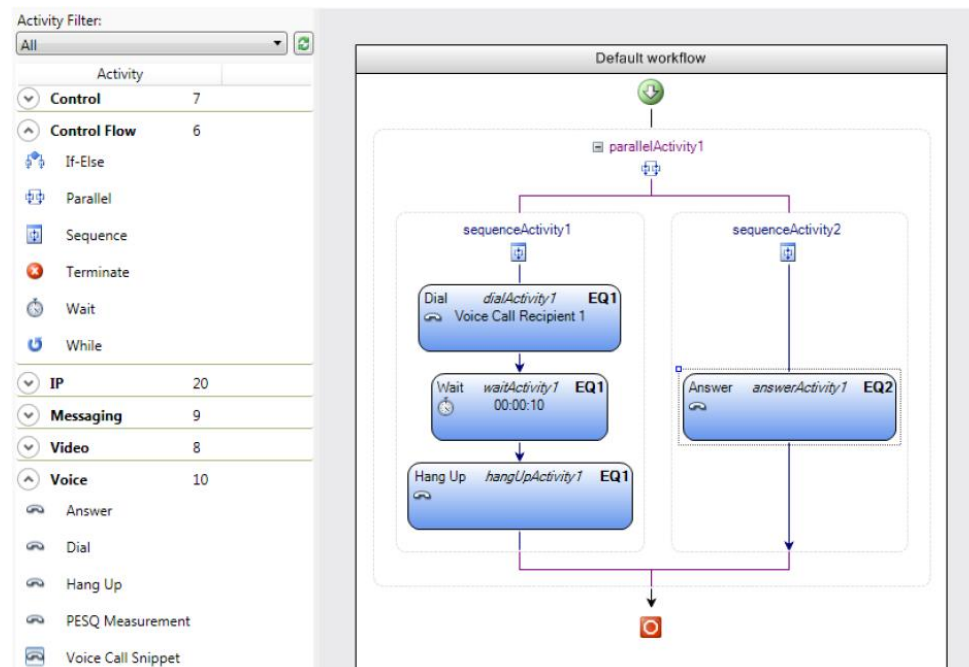
Composing and configuring scripts (13/13)

- UE Control functionality.

    - Control functions accessible from the Equipment Tab of the Navigator can be applied in a script as activities.

    - RAT lock and Band lock activities are more generic than the manual control functions.

    - UE control activity in a script can only be executed if the target device is capable of the operation in question.

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Validating and Running Scripts (1/5)

- Validating Scripts.

    - To ensure a script is syntactically correct.

    - To make sure it does not assign tasks that you devices don't support

        .

    - A non-trivial issue when building complex scripts.

    - Also crucial for UE control functionality.

    - Scripts are automatically validated when started.

    - Can be validated in advance.

Script Validation	✕
Script validation succeeded	

✓ No errors found.

[OK]

INFOVISTA
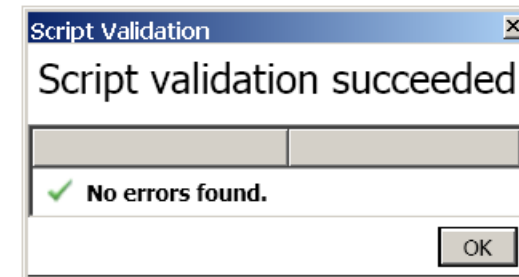
Validating and Running Scripts (2/5)

- Running Scripts – General aspects.

  - Scripts can be run from the Service Control Designer or Service Control Monitor.

  - Devices involved in a script execute their assigned activities independently of one another with the following exceptions:

    - When devices engage in a service where they interact.

    - When devices are involved in different workflow branches that converge. In this case, all branches are synchronized before the execution proceeds past the point of convergence.

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Validating and Running Scripts (3/5)

- Running Scripts from the Service Control Monitor.

  - Click the Open Script button to select your script.

  - Click the Run Script button to start the script.

  - Click the Stop Script button to stop script execution.

  - Status tab shows current status for each device.

  - Summary tab shows statistics on the outcome of each activity type.

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# Validating and Running Scripts (4/5)

- **Running Scripts from the Service Control Designer.**

  - Enter the script menu and choose Run.

  - The Status and Summary tabs replace the usual contents of the window.

  - Click the Stop Script button to stop script execution.

  - Click the Return to Designer button to return to the Service Control Designer window.
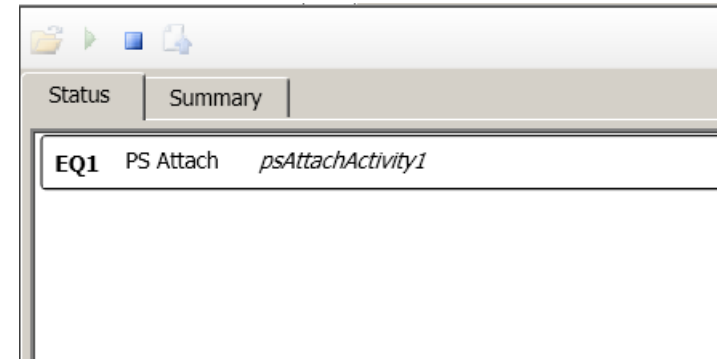
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Validating and Running Scripts (5/5)

- Suppressing parts of a script.
  - To run only certain parts of a script and exclude others, you can disable any individual activity.
    - Right-click and deselect Enabled from the context menu.
    - Change Enable flag to False in Properties pane.
  - Activity currently disabled appears dimmed in the workflow pane.
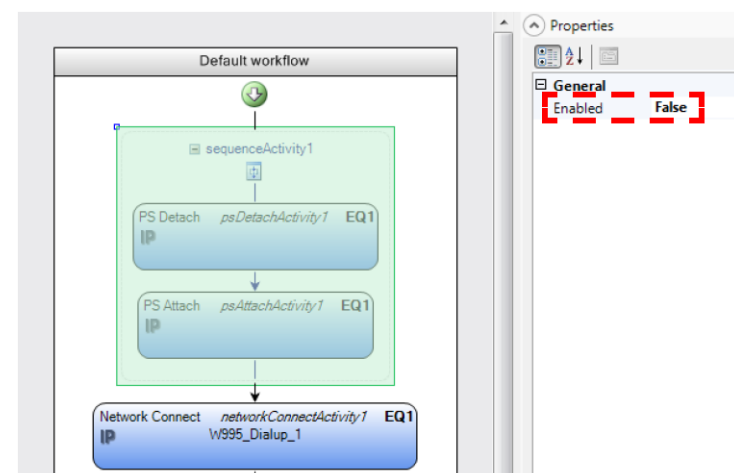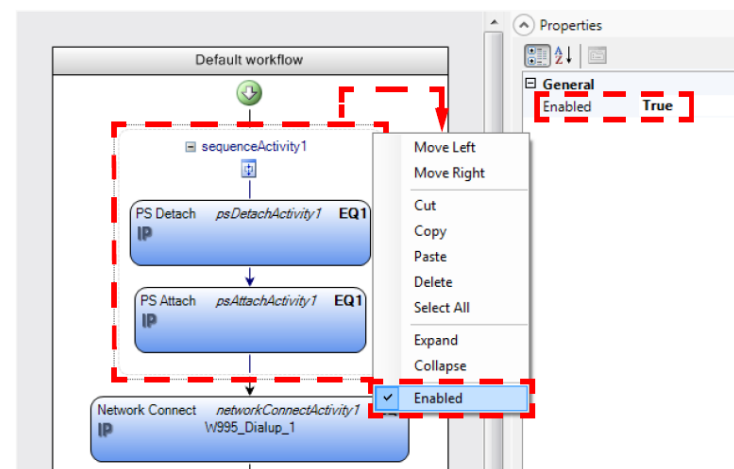
Saving and Loading Scripts

- To save a script to file, click the Save button 💾 on the Service Control Designer toolbar.

- Extension of the file is .tsc (for TEMS Service Control).

- The Save Script dialog contains the following options:

  - Description. Free-text field.

  - Format. Standard or Redistributable.

- You can save the script as a snippet.

- You can save the script as an image.

- To open an existing script stored on file, click the Open button 📂 on the Service Control Designer toolbar.

THANK YOU!