COURSE TABLE OF CONTENTS

Python for KPI Analysis and Testing

OEM: Koenig Original • Duration: 4 Days (30 hrs)

COURSE MODULES & TOPICS

Module 1: Virtual LTE Lab Architecture

- Ubuntu VM and Oracle VirtualBox overview
- Network adapters, interfaces, and IP addressing
- LTE lab components: UE, eNodeB, EPC, external network
- Roles of Open5GS and srsRAN
- Locations of configuration files, logs, and counters
- Lab operations: resource limits, snapshots, restoring state
- Inspect environment: confirm resources, locate files, record inventory

Module 2: Python Essentials for Lab Analysis

- Running Python scripts and using the terminal
- Variables, strings, numbers, lists, dictionaries, functions
- Reading and writing text files
- Working with timestamps and structured records
- Handling errors and validating input data
- Organizing scripts into reusable modules
- First log-processing script: extract fields, write to CSV

Module 3: Data Collection and Organization

- Log-based data collection methods
- Parsing structured and unstructured text
- Collecting results from command-line tools
- Working with CSV, JSON, tabular datasets
- Data collection intervals and time synchronization
- Handling missing, duplicated, or malformed records
- Designing data directory and file-naming conventions
- Build repeatable data collection workflow

Module 4: LTE Service KPI Calculation

- KPI definitions, units, measurement windows, denominators
- Attach and registration success rate
- Session/bearer establishment success rate
- Ping success rate, latency, packet loss
- Throughput: uplink, downlink, measurement interval
- Stability and drop rate indicators
- Resource and system indicators: CPU, memory, process status
- Calculate baseline KPIs and compare with source records

Module 5: Python Tools for KPI Analysis

- Tabular data analysis with pandas
- Filtering and grouping by test run or scenario

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- Aggregation by time interval
- Handling outliers and incomplete runs
- Descriptive statistics: mean, median, min, max, percentiles
- Comparing baseline and subsequent runs
- Reproducible analysis and script configuration
- Compare test runs and produce summary tables

Module 6: Visualization and Reporting

- Choosing charts for each KPI
- Time-series plots for latency, throughput, resource use
- Bar charts for success rates and scenario comparisons
- Labeling charts with units, conditions, run identifiers
- Exporting results to CSV and images
- Building repeatable summary reports
- Generate KPI report with Python scripts

Module 7: Troubleshooting Using KPI Evidence

- Relating KPI changes to log events
- Identifying causes of attach, session, connectivity failures
- Distinguishing radio, core, network, host-resource symptoms
- Correlating timestamps across components
- Separating anomalies from repeatable issues
- Recording findings and evidence
- Investigate LTE test failure and document evidence

Module 8: Test Design for Virtual LTE Lab

- Translating requirements into measurable checks
- Defining objectives, preconditions, steps, expected results
- Positive and negative test scenarios
- Repeatability, run duration, sample size
- Pass/fail thresholds and tolerances
- Test data, configuration control, run identification
- Avoiding misleading comparisons
- Create LTE KPI test plan with scenarios and thresholds

Module 9: Automated Testing with Python

- Structuring test scripts and reusable functions
- Executing lab commands from Python
- Capturing command output and return codes
- Applying timeouts

Module 10: Robot Framework Integration

- Integrating Python KPI checks into Robot Framework test suites

Module 11: Test Validation and Capstone Project

- Test quality and result validation
- Capstone: End-to-end LTE KPI test