Building and leveraging the next generation of Connected Devices

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Building a Portfolio of Modern Connected Devices

**Easy, Simple, and Fast Connectivity**

Build the best mobile connectivity experience for customers. Makes it easy to discover, set up, and get connected to LTE. Make it simple to add a data plan, and download at Gigabit LTE speeds on Windows 10 devices everywhere.

**Devices that Customers Love**

Build modern devices at all price points with features that meet the needs of consumers and the modern workplace. Today’s connectivity investments are foundational for the future of connected devices on the intelligent edge and 5G.
What is an eSIM?

✓ eSIM (eUICC + Profile) is a global specification by the GSMA which enables remote SIM provisioning

✓ Simpler device setup without the need to insert or replace a physical sim card
Connectivity + eSIM Value Propositions

**Mobility & Productivity**
- Easy to Activate
- Always Reliable
- Work from Anywhere
- Gigabit+ Speeds

**Security**
- Remote Lockdown
- Cloud-based Security
- Bypass Untrusted WiFi

**Manageability**
- Asset Management
- Optimal Data Plan Usage
- Data used for Corporate Device Only
Modern connectivity journey

Connectivity during OOBE*
- Choosing SIM/eSIM
- Choosing a connection
- Provision new connectivity

Connectivity post OOBE
- Connectivity setup per GSMA standard flow
- Connectivity setup using Mobile Plans app
- Connectivity setup using enterprise MDM

Dual SIM management
- DSSA: choosing active SIM
- DSSA: removing or inserting physical SIM

Building devices with modern connectivity
- Windows eSIM ecosystem
- eSIM hardware design options
- eSIM hardware requirements
- eSIM testing guidance

Shipping devices with modern connectivity
- Value propositions
- Lesson learned with early adopters
- Device certifications

*OOBE: out of box experience
**DSSA: Dual SIM Single Active
Connectivity setup during OOBE

- User inserts an active SIM or an eSIM with active profile
- Switch to a different eSIM profile when there are more than one available
- Choose available eSIM profile to enable
- Search available eSIM profile (assuming Wi-Fi or other bootstrap connectivity)
### Modern connectivity journey

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*OOBE: Out of Box Experience

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Manage eSIM profiles from cellular setting page
✓ **Windows 10 implementation**
  ✓ LPA – Local Profile Assistant (NT service)
  ✓ Cellular Settings user experience flow

✓ **GSMA specifies architecture and user experience guidance**
  ✓ Profile discovery
  ✓ Profile download and installation
  ✓ Local profile management (list, switch, delete)

✓ **Assumes WiFi or other connectivity for provisioning**
Manage eSIM profiles

1. List of profiles
2. Add profile by search
3. Add profile with a QR code
4. Enable profile
5. Disable profile
6. Nickname profile
7. Delete profile
8. Reset eSIM
9. Set default SM-DP+ address

WinHEC 2018

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Mobile Plans – Inbox app
Streamlining LTE connected PC data activation flow.

Enable seamless eSIM profile download for LTE connected PCs.

Simplify Mobile Operator – Customer relationship.
Mobile Plans User Journey
Mobile Plans user journey

1. Post OOBE notification invites user to connect their device
2. Select a mobile operator service
3. Mobile Plans app redirects user to mobile operator website
4. User is taken to operator’s web portal for sign up
5. User is returned to the app for the eSIM profile download
6. Device is fully provisioned on the cellular network
✓ Streamline eSIM profile download through Mobile Plans inbox app
✓ User interacts directly with operator website to complete the transaction
✓ Mobile Plans receives the profile information and coordinates the download with the LPA
✓ User experience is streamlined for Windows users (i.e. no QR code)
eSIM through Mobile Device Management
Enterprise eSIM scenario

New employee first day

New employee now fully mobile with eSIM

Receive a cellular-enabled PC

New employee gets notification on device about cellular connection

IT admin orders data plan and receives eSIM activation code

IT admin imports eSIM activation code into Intune and assigns to new PC
Subscription setup for enterprise managed devices

This solution extends enterprise MDM to include eSIM management

✓ Add/remove enterprise eSIM profiles
✓ Enterprise managed policy control access to LPA (Cellular Settings)

Assignment and deployment of eSIM profiles managed by Intune

✓ Profile requests in real time to operators BSS are coordinated through a 3rd-party proxy ("orchestrator")
IT admin steps for enterprise eSIM provisioning

1. Intune admin console entry
2. eSIM device for new employee is enrolled
3. Create user group for eSIM device
4. Import eSIM activation code
5. List of imported eSIM activation codes
6. Assign subscription to eSIM device
7. Cellular connection notification pop-up on new employee device
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Choose active SIM in Dual SIM Single Active devices
DSSA: When physical SIM is inserted and eSIM is active
DSSA: Physical SIM removed with eSIM present
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* OOBE: Out-of-Box Experience
The Windows ecosystem is fully ready for eSIM

removable or embedded eSIM card + Modem firmware with eSIM support + Windows 10 Creators Update or later = Window 10 devices with eSIM capability

Acer Swift 7
Surface Pro LTE
Lenovo Yoga C630
HP Spectra Folio
# eSIM hardware design options

<table>
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<tr>
<th></th>
<th>Today: physical SIM slot</th>
<th>Option A: physical SIM slot</th>
<th>Option B: physical SIM slot + embedded SIM</th>
<th>Option C: embedded SIM only</th>
</tr>
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<tbody>
<tr>
<td>SIM card form factor</td>
<td>Nano SIM</td>
<td>Nano SIM</td>
<td>Nano SIM + MFF2</td>
<td>MFF2</td>
</tr>
<tr>
<td># of operator profiles</td>
<td>Single profile</td>
<td>Multiple profiles</td>
<td>Multiple profiles</td>
<td>Multiple profiles</td>
</tr>
<tr>
<td>Remote SIM provisioning</td>
<td>[x]</td>
<td>[✓]</td>
<td>[✓]</td>
<td>[✓]</td>
</tr>
<tr>
<td>Legacy Nano SIM card support</td>
<td>[✓]</td>
<td>[✓]</td>
<td>[✓]</td>
<td>[x]</td>
</tr>
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</table>

**Legend:**
- ![Standard SIM](image)
- ![Standard and reprogrammable SIM](image)
- ![Embedded and reprogrammable SIM](image)

**Dual SIM Single Active (DSSA) Recommended**
Hardware requirements for eSIM capable devices

Modem chipset and modem module
✓ Modem firmware support for DSSA
✓ Modem support with MBIM interface for eUICC OS update

eUICC chip
✓ eUICC shall contain only the (MF) Main File system*
✓ eUICC shall be loaded with GSMA ROOT CI certificate
✓ eUICC shall support firmware update via Windows Update

*GSMA eSIM technical specification (SGP22) section 3.4.3
eSIM testing & certification guidance

Complete a successful HLK test run
✓ Validate modem firmware eSIM support*

eSIM functionality testing (from Cellular setting page)
✓ Profile download and installation:
  ✓ Shall cover both QR code and search (SMDS) scenarios
  ✓ Shall test against live SM-DP+ server with GSMA Root CI support
✓ Profile operations to validate: enable, disable, delete, change nickname, eSIM reset

Mobile Plans app testing in the relevant geos

Operator profile and eUICC interop testing
✓ Test with different operator profiles in the geos where the device will be available

GCF/PTCRB certification
✓ eSIM test cases are mandatory for devices with soldered eUICC

*Windows 10 HLK Test Reference
HLK: Hardware Lab Kit
Preparing for 5G

5G ecosystem

✓ 3GPP Rel 15 is expected to be ratified in Q3’18, followed by Rel 16 in Q4’19
✓ Most carriers plan to launch Sub6 5G NR (new radio) first, followed by mmW 5G NR
✓ Carriers plan early 5G network deployment in late 2018 or early 2019
✓ Commercial 5G device(s) launch from OEMs expected in 2019

5G PC readiness

✓ Launching 5G PC requires both Windows 10 OS capability and 5G modem drivers from IHV
✓ Microsoft has planned 5G early enablement in next Windows release to enable OEM to begin test/validation
✓ Commercial readiness of 5G modem drivers will be gating product launch for PC OEMs
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Certification

- All cellular devices need to pass appropriate certifications to be commercialized
- These cellular certifications are required in addition to electronic device regulatory certifications such as RED (EU), ROSH, FCC(USA), etc..
- Industry standard certifications are GCF (EU), PCTRB (US), TELEC (Japan) and CTA (China).
- Certification must be performed by accredited lab (GCF, PCTRB)

Note:
- Data Only devices, such as PCs with cellular, required a lighter certification than voice enabled products (smartphones);
- Using GCF / PCTRB certified modules will reduce device certification effort
Certification

- Level of certification will depend on your sell channel choices

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<th>Sale Channel</th>
<th>Industry standard cellular certification</th>
<th>MO reduced certification</th>
<th>MO full certification</th>
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<td>Retail only</td>
<td>Mandatory</td>
<td>Optional</td>
<td>Not needed</td>
</tr>
<tr>
<td>MO – Non Stock</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Not needed</td>
</tr>
<tr>
<td>MO – Stock Sell in MO channel</td>
<td>Mandatory</td>
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- Those are examples and are not fully reflective of each Mobile Operator certification process.
- Please consider certification as part of your overall device schedule and engage with MO earlier in the device planning when applicable.

Note: Enterprise adoption may be different than consumer when it comes to product certification and commercialization.
Learnings from OEMs

- Modem vendors can provide ready to commercialize Modules
- Engage with MSFT and IHV to understand what can be leveraged for each product

Innovation is difficult to translate into design without restriction
- Battery life: Select power efficient components, measure the power consumption and power floor
- RF performance: Engineer for your speed targets early in the design phase (e.g. Gigabit LTE)
- Thermal constraints: Ensure your thermal design supports your performance goals

- Plan for the modem firmware update process early in the design phase
- Test OS upgrade with Windows Insider Program prior to commercialization

- Many MOs support eSIM today – validate your implementation before launch
- Include eUICC with GSMA root CI certificates also on test units
- Enable SMS support for roaming notification which is required by European Mobile Operators

- IHV provides default configuration files that needs to be customized per market/Mobile Operators
- Get familiar with Windows COSA extensions process
# Key take away and next steps

- **Plan having LTE options in your modern portfolio for consumer and enterprises**
  - eSIM is a tool to enable LTE connectivity seamlessly for both consumer and commercial
  - If eSIM is enabled on your device, ensure the testing guidance is followed early in the process

- **Microsoft supports several consumer and commercial scenarios for eSIM / LTE adoption**
  - Based on the target customer for your devices, identify the right commercialization path which may include Mobile Operator testing

- **Reach out to your Microsoft counterparts for any cellular deployment and eSIM guidance**
  - One of our eUICC partners is participating in the expo outside - feel free to go introduce yourself and experience their demos