SIMPLEWAY TECHNOLOGIES LTD.

The Soul Concept

Today, users own more and more electronic devices. We know that device user priorities and needs change all the time. Sometimes high performance is a priority, and other times mobility is more important. Sometimes you need certain hardware features or specific hardware to get the job done. For these different purposes you use different devices. You would like to have an ecosystem which allows you to work seamlessly and securely using your different devices. Your “digital soul”, that is, your data, applications, settings and user experience should always be up-to-date and readily available at your fingertips. At SimpleWay Technologies we have created the Soul Concept so that you can stay in touch with your digital soul all the time.

The Soul Concept - Different devices, single soul

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1. What is the Soul Concept?

1.1. The Soul Concept - in a nutshell

The patent-pending Soul Concept gives you the opportunity to use a single device interoperability system (DIS) with a single OS and your data set, settings and user experience on any computer device in a simple and natural manner. At the heart of the concept, we envision that this single OS can be loaded on your device of choice from a Soul Concept “centre” which could be a stand-alone gadget or a smartphone or even a wearable device as shown in Figure 1. Just set up a connection, and away you go!

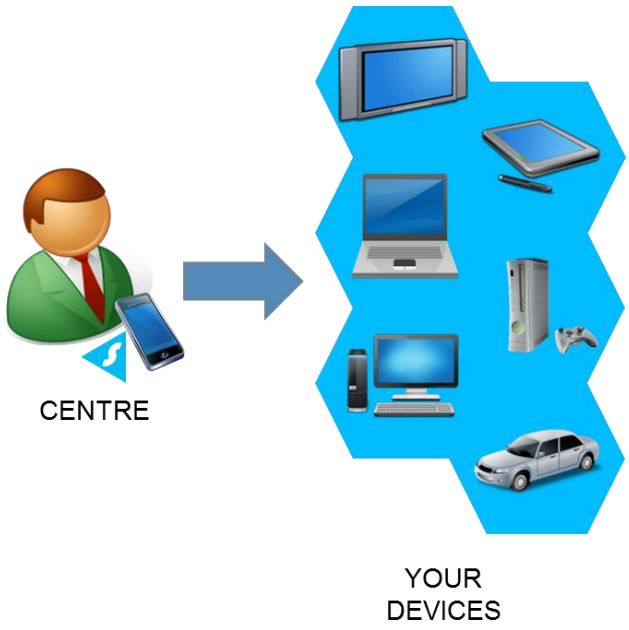


Figure 1: Connecting the Soul Concept centre to your devices

1.2. Synchronization is the key to a seamless ecosystem

Three key challenges posed by the increasing number of devices owned by users today:

- Synchronization
- User experience inconsistency

- Compatibility problems

Of these three challenges, synchronization is the key issue. Current approaches to synchronization fall short in many ways:

- Privacy and/or security risks.
- Synchronization scope is limited.
- Loss of connectivity means loss of synchronization as well.
- Slow network speeds also pose an issue.

The Soul Concept addresses many of the issues with synchronization today. By solving these issues, the Soul Concept creates a seamless ecosystem with a single digital soul.

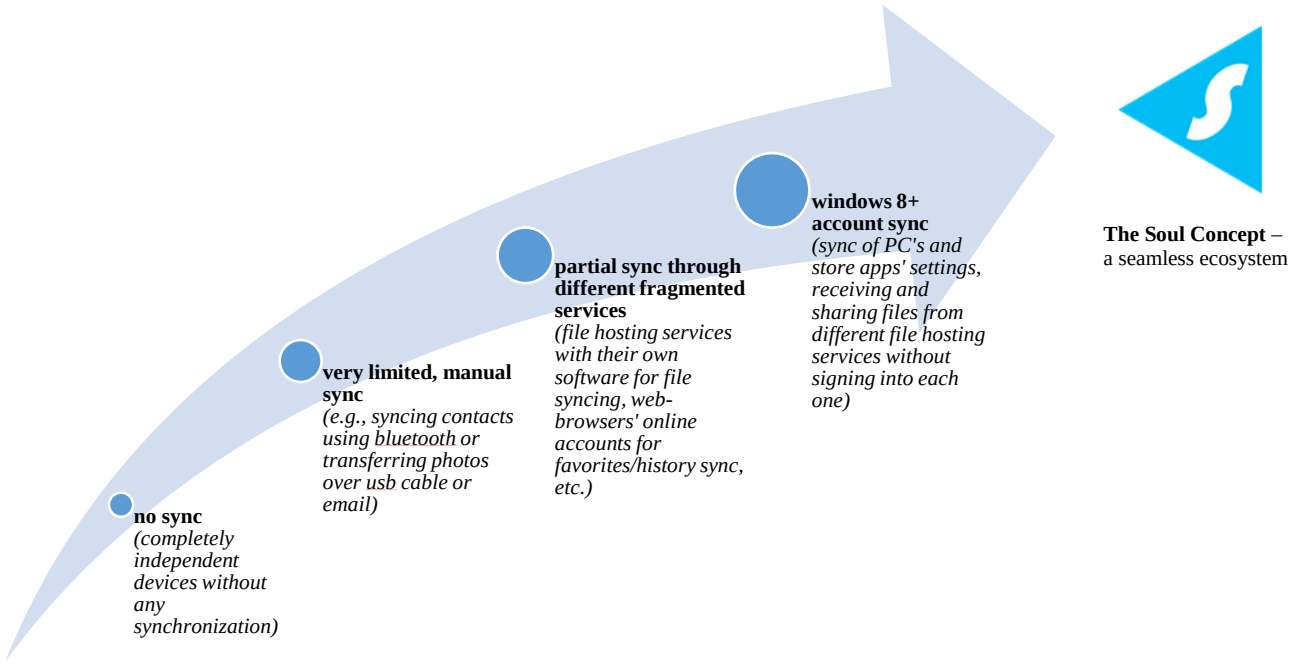


Figure 2: Evolution of synchronization

1.3. What wireless connection will the Soul Concept use?

We believe that Wi-Fi will be the best way to set up the connection between the Soul Concept centre and

your devices. Here's why:

- Wi-Fi is the most used wireless connectivity technology in the world today. It can be found on almost every computer device.
- Wi-Fi has good performance. As shown in Figure 3, today's wireless network transmission speeds are not far from the HDD read data speed.

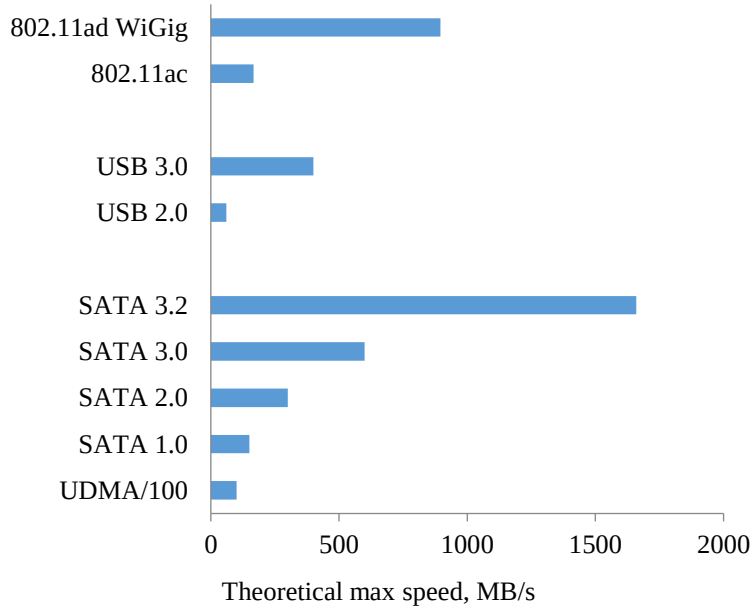


Figure 3: Wi-Fi speeds compared to hard drive speeds

Over the last few years, the speed of wireless data transmission has grown much faster than the speed of storage interfaces as shown in Figure 4.

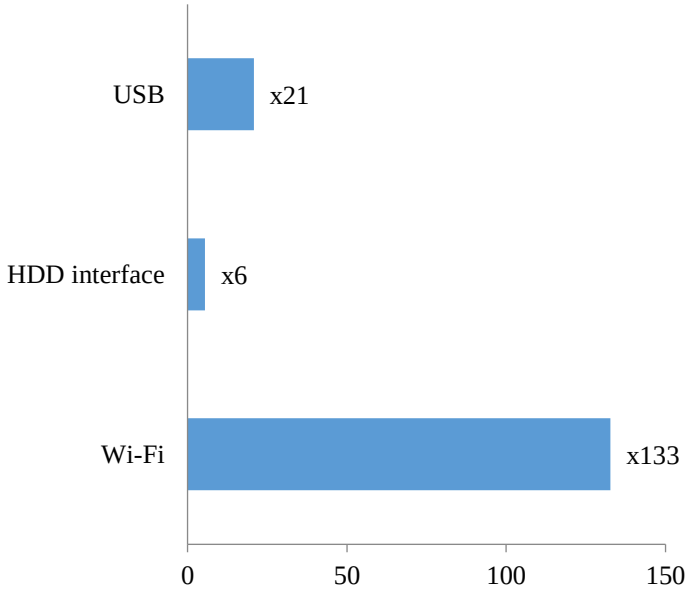


Figure 4: Throughput growth from 2004-2015 of different interfaces

- Wi-Fi can be made secure.

While we suggest Wi-Fi, we foresee the possibility of other type of connections such as wireless USB[1], Bluetooth, or any other connectivity technology being used. Alternatively, wired connections can be used as well, for example, via a docking station.

1.4. What are the requirements for your devices?

Devices that will be used in conjunction with the centre must meet the following requirements:

- Compatible platform (architecture)
- Will have a display and input devices (touchscreen, keyboard/mouse, etc.)
- BIOS/UEFI that provides the ability to boot operating system over wireless channel
- Compatible wireless module

1 https://en.wikipedia.org/wiki/Wireless_USB

Most devices today are compatible with the Soul Concept with some minor software/firmware modifications. The Soul Concept needs BIOS/UEFI that provides the ability to boot operating systems over a wireless channel (currently, most modern PCs already support booting from a wired network[2]). Moreover, any of your devices can be simultaneously compatible with the Soul Concept and be self-sufficient, that is, able to function in a traditional way. For example, during a system start-up a PC can provide the option to boot the OS from the centre.

1.5. What hardware configurations/architectures are supported?

The Soul Concept uses concepts which are already familiar to many users. Major technology companies such as Microsoft see the need to offer features we plan to offer as part of the Soul Concept. For example, Windows To Go[3] enables users to boot a full version of Windows from external USB drives on host PCs and support different hardware configurations.

We aim to design the Soul Concept for shipping with kernels for both x86 and ARM architectures. The Soul Concept will use the appropriate kernel automatically and seamlessly, depending on which of your devices is connected.

1.6. Are my devices compatible without a firmware upgrade?

Your existing devices can be made compatible with the Soul Concept even without a firmware upgrade. Using one or more miniature USB dongles, you can wirelessly connect and begin using the Soul Concept. For example, if you choose to set a smartphone as the Soul Concept centre, and you want to connect it to a laptop, you just need to attach a USB dongle as shown below in Figure 5:

2 https://en.wikipedia.org/wiki/Network_booting
3 https://en.wikipedia.org/wiki/Windows_To_Go

Figure 5: Attaching a USB dongle to enable connection between the Soul Concept centre and a laptop

The laptop will recognize the USB dongle and work as a usual USB flash drive with the OS loaded on the dongle. Any device can be booted through this USB dongle in the same way as from an ordinary USB flash drive. The only one thing you have to do is to insert the USB dongle into your computer and to change the boot order to a USB flash drive in BIOS.

1.7. What about performance issues?

Since all the program code runs on your device, your device’s hardware power is fully utilized.

For the purpose of increasing read access speed, your device's storage can be used for caching. In general:

- When some piece of data is read from the Soul Concept centre storage for the first time, it is also cached.
- Subsequent readings of this data are performed from the cache.
- OS maintains the file-checksums correspondence tables for the main storage as well as for every cache (from your different devices).
- When the OS boots and discovers previously cached data on, for example, your PC's storage, the checksum table of that cache is compared against the reference one (from the main storage) to determine which data is still unchanged, and therefore whether the cached copy of that data can be used).

- The data writes are performed in write-through mode to ensure that the Soul Concept centre storage always contains the most actual data. The checksum tables are updated after changing/creating data as well.
- If the OS discovers that the Soul Concept centre is connected to a power source, then more aggressive prefetching is performed and the changed/new data is being transferred to the cache during system idle time (and thus even before the first read attempt).

1.8. How secure is the Soul Concept?

Figure 6 below shows the various measures we intend to use to make the Soul Concept as secure as possible:

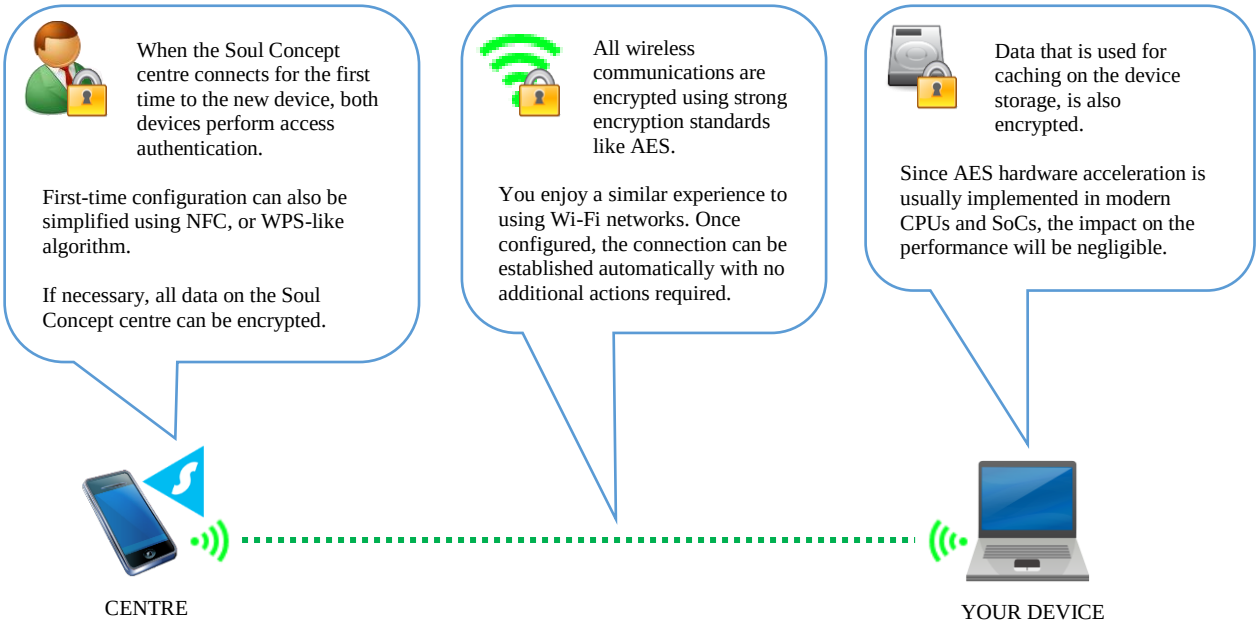


Figure 6: Security in the Soul Concept

1.9. What about adding/replacing devices?

Adding a new device is fairly simple for you. Here is an example process:

- You turn on your device which is a computer/tablet/console/etc.
- It presents you with an option "*Press [button] to use the Soul technology*".
- After pressing [button], you perform authorization process (by entering the same passcode on both your device and the centre, or using near field communications (NFC)[4] if available), then OS boots and automatically installs drivers for new hardware.
- That's it. From a user experience standpoint, all subsequent bootups on this device are performed seamlessly.

In case your new device is not yet compatible with the Soul technology, you can simply insert a special USB dongle and change the boot order in BIOS/UEFI. You do not even need to authorize devices because the centre and the dongle are preconfigured for secure communication.

In case you buy a new device, replacement is equally simple. All you need to do is connect the Soul Concept centre to the new device, and this device seamlessly becomes part of your ecosystem.

1.10. What about automatic backups?

Due to the fact that the Soul Concept centre frequently connects and works with devices that have their own storage drives, it is much easier to organize regular automatic backup to these drives.

1.11. What are your everyday experiences like with the Soul Concept?

The Soul Concept enhances your everyday experiences such as communication, driving and

4 https://en.wikipedia.org/wiki/Near_field_communication

entertainment in many ways:

1.11.1. Your communication experience with the Soul Concept

- You get a phone call while working at your PC/laptop/tablet. You receive a notification on your PC screen and you answer the call using your PC/laptop/tablet.
- Alternatively, you answer the call using your mobile phone. This is possible because the speaker and microphone of mobile phone are recognized by the OS as ordinary wireless headset.
- This flexibility is enabled because the OS recognizes the internal components of the mobile phone such as the microphone, sensors, GSM module and even the display as connected external devices.

1.11.2. Your driving experience with the Soul Concept

- Your car navigation system remembers the address of a restaurant that you found via your smartphone one week ago thanks to the enhanced synchronization capabilities of the Soul Concept.
- Contact books with addresses on your PC, on your laptop and in your car are always the same, even without an Internet connection.
- When your spouse gets behind the wheel of your car, the whole electronic system of the car is completely personalized for him or her.
- The music or videos that you downloaded yesterday to your home PC are immediately available in your car.
- You can use Skype in your car as well as any other of your PC software.
- If necessary, you can use any function of your PC (from computer games for kids in the back seat to receiving business emails). Moreover, you aren't limited by your phone's or tablet's performance because in-car hardware can be more powerful and less energy constrained than your phone or your tablet.

1.11.3. Your entertainment experience with the Soul Concept

- When turning on your smart TV, you can view yesterday's party photos without thinking about any connections or data transfer.
- On your TV you can use the familiar environment that you have customized for yourself.
- You are able to view and even edit documents in full-fledged Microsoft Office on your TV.
- Buying a new TV? Just connect it to the Soul device and there is no need for additional efforts. For example, you don’t need to enter your password for Skype or streaming services and don’t need to synchronize browser history.
- Do you prefer a specific browser? Now you are not limited to the browser and software which were pre-installed on your TV.
- You can personalize your TV just like you personalized your computer.

1.12. Can you work simultaneously and in parallel on several devices?

We foresee the possibility of using different approaches in the Soul Concept centre to implement full-fledged parallel work of several host systems.

1.13. Does a smartphone have enough storage capacity for implementation of a centre?

Today, smartphones and other portable devices have storage capacities from 32 to 128GB. This is enough for a full OS, common software, office software suites and documents. Please keep in mind the following as well:

- The storage capacity of modern devices is increasing rapidly.
- While using the Soul technology, you are able to work with your device's storage as an external storage drive. So, for example, you can install large-size games to your gaming computer's hard drive.

1.14. What about energy efficiency of the Soul Concept?

The Soul Concept is energy efficient in many ways:

- Since distances involved are likely to be short, transmission power can be adjusted to improve power-savings.
- The Soul Concept centre is unlikely to need to drive displays, which results in even more savings.
- Energy-efficient storage such as eMMC flash memory technology is used in most contemporary tablet PCs. It can be used in the Soul Concept to reduce power consumption.
- Intelligent caching on your devices further helps reduce the amount of transmitted data and therefore power consumption.

2. Market relevance

2.1. What are the benefits for you as a user?

The Soul Concept offers a variety of benefits:

- With the Soul Concept technology all your documents and data are available on your computer, without:
  - the need for an internet connection, or
  - installing syncing-software on different platforms.

  This means less time lost on these activities.
- Your user experience is almost the same on any computer. No need to get used to different operating systems and applications.
- The possibility of file corruption when using different applications for editing is reduced.
- You don’t need to repeat activities like changing settings, installing applications, performing software updates and antivirus scanning on dozens of different devices.
- For syncing you don’t need to upload your personal data to the cloud and expose it to privacy and security risks.
- Device replacement is extremely easy. All you need is to connect the centre to the new computer, and you will get the environment that you are used to, with the new hardware.
- The computer that supports the Soul technology is still able to work in a traditional way.

2.2. Market trends

2.2.1. Technological background

Manufacturers realize the need for many of the features of the Soul Concept, and are moving in the same direction as we are. Also, technology is rapidly improving which makes many of these features feasible. For example:

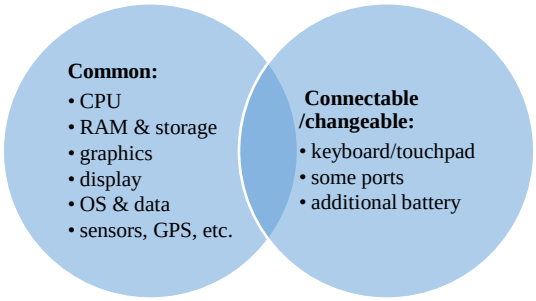
- OS manufacturers are unifying mobile and desktop OS and API. Examples can be found in Microsoft Windows 10 and Windows 10 Mobile.
- Wireless connection throughput is increasing at a faster rate than HDD throughput as shown previously in Figure 4. Several new high speed standards are coming to the market such as WiGig[5] and Li-Fi[6].
- Modern OSes can be booted on multiple computers with different hardware configuration. An example of this is Microsoft Windows To Go[7].
- Technologies that optimize and adapt user interface and experience to physical form-factor and display size are becoming a part of modern OSes. An example is the Continuum[8] in Microsoft Windows 10.
- CPU manufacturers are introducing energy-efficient x86 SoCs & CPUs designed for smartphones and tablets to the market. An example is the Intel Atom system on chip[9].
- The smartphone market has started to adopt wireless charging technologies.[10]

2.2.2. Hybrid devices

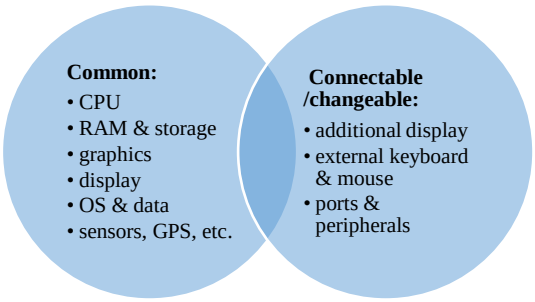
The demand for hybrid devices has significantly increased in recent years. There are many 2-in-1 devices such as: ASUS PadFone[11], Microsoft Display Dock for Lumia[12], HP Elite x3[13], Ubuntu Edge concept[14], Intel WiDi[15] and Miracast[16] technologies. Figure 7 shows different examples of current hybrid devices with their permanent and connectable/changeable components:

5 http://www.wi-fi.org/discover-wi-fi/wigig-certified
6 https://en.wikipedia.org/wiki/Li-Fi
7 https://technet.microsoft.com/en-us/library/hh831833.aspx
8 https://msdn.microsoft.com/en-us/library/windows/hardware/dn917883%28v=vs.85%29.aspx
9 https://en.wikipedia.org/wiki/Atom_%28system_on_chip%29
10 http://www.cnet.com/news/wireless-charging-set-for-huge-growth-in-next-10-years
11 https://en.wikipedia.org/wiki/Asus_PadFone
12 http://www.theverge.com/2015/10/6/9453577/microsoft-display-dock-announced-price-release-date-continuum
13 http://store.hp.com/us/en/cv/elite-x3
14 https://en.wikipedia.org/wiki/Ubuntu_Edge
15 http://www.intel.com/content/www/us/en/architecture-and-technology/intel-wireless-display.html
16 http://www.wi-fi.org/discover-wi-fi/wi-fi-certified-miracast

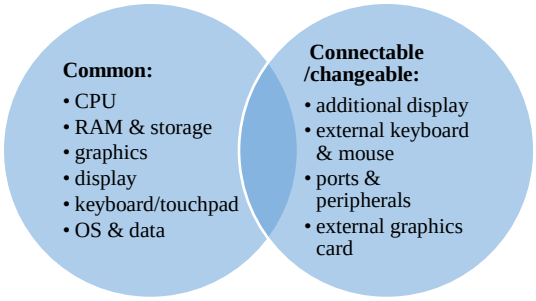
2-in-1 devices



Tablets with a traditional docking station



Laptop with a dock-station



ASUS PadFone

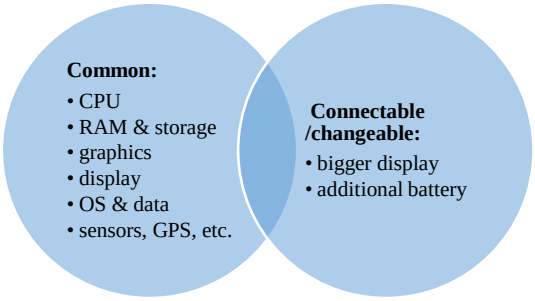


Figure 6: Various hybrid device combinations

- While these hybrid devices aim to reduce performance limitations, really they are a “kludge” as:
  - Using a hybrid device gives you the illusion of change without there being real change. For example, connecting a smartphone to an external display, keyboard and mouse gives the illusion of change to a powerful “desktop” mode. In reality, the performance is still the less powerful “smartphone” mode.
  - Flexibility is limited as hybrid devices are usually limited to only two device type variations.
  - You still need to synchronize between hybrid device and non-hybrid devices.
- The Soul Concept addresses these limitations:

- You can get any combination you want, such as a phone-desktop or a laptop-tablet-TV combination.
- Unlike existing hybrid devices, the Soul Concept allows you to get the maximum performance from your devices. For example, while it is in smartphone mode, it uses the phone's CPU and RAM. Once it gets connected to a desktop, it starts using much more powerful desktop hardware.

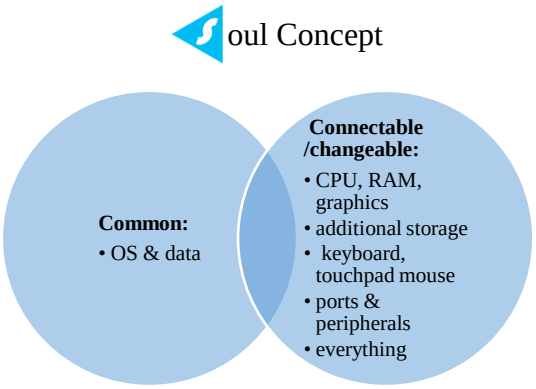


Figure 7: Soul Concept addresses the limitations of existing hybrid device combinations

2.3. The Soul Concept – a single ecosystem

As shown in Figure 8, the Soul Concept represents a big step forward in the evolution towards a seamless user ecosystem with an omnipresent digital soul.

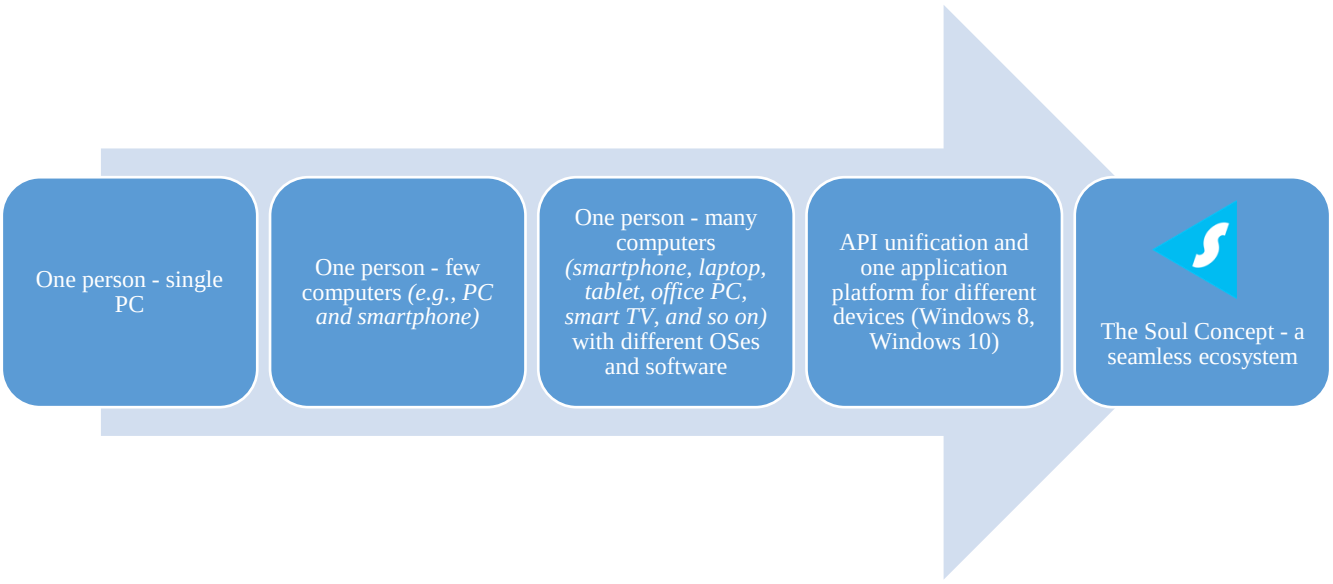


Figure 8: Evolution towards a seamless ecosystem

3. Notices

“Soul Concept”, “Different devices, single soul” and  are trademarks of SimpleWay Technologies Ltd. All other trademarks are property of their respective owners.

The Soul Concept is patent pending.