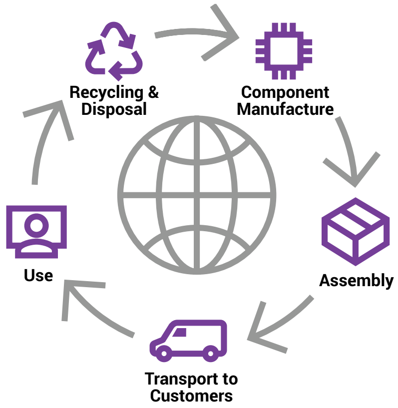
LIFE CYCLE ASSESSMENT OF

Ribbon Apollo 9408



Ribbon is committed to reducing the environmental impacts of our products, covering all stages of the lifecycle. We use lifecycle assessment to find the most significant contributors to the environmental impact of our products and inform our sustainability strategies at the product and corporate level.

What is an LCA?

A life cycle assessment is the compilation and evaluation of the inputs, outputs and potential environmental impacts of a product system throughout its life cycle. (ISO 14040: 2006, sec 3.2.)

Product Chosen

A Ribbon Apollo 9408 is the industry's highest capacity and highest density platform for 100GbE, 400GbE, and future 800GbE transport. It is designed to provide network operators with the lowest cost per bit for long haul and high traffic density metro applications. Not only does Apollo 9408 deliver outstanding performance, it incorporates many features to facilitate deployment and operability. It is packaged in a compact 2RU chassis with front to back cooling for data center residency. MPO fibers enable installation simplicity, and all common modules are field replaceable. The Apollo 9408 was chosen for this study to support Ribbon's engagement with key customers. The chosen configuration represents the most frequently purchased option. The mass includes packaging, power cords and accessory kits.

Study Parameters	
Lifetime of the product	15 years
Use location	Germany
Cards	MPQ_8 Octal 400G/800G transponder muxponder
Capacity	1.6 Tbs
Power Supplies	1 + 1 redundancy
Mass	36.882 kg

Results Summary

The impact categories assessed as part of the LCA concentrated on global warming potential over a hundred-year time horizon (GWP100). Global warming potential is also known as a "product's carbon footprint". The results show that 93% of the lifetime impacts are attributed to the in-use phase via electricity consumption. On a global basis, Germany falls in the mid-range of carbon impact per kWh of electricity, which means the use-phase impact can be proportionally lower or higher depending on its installed location. For example, deployment on the NPCC electrical grid, which supports New York and other major US north eastern cities, would see the overall impact reduce to 10,039 kgCO2e over the product lifetime, with 88% from in-life energy usage. Transportation and end-of-life management are smaller contributors to the overall footprint.

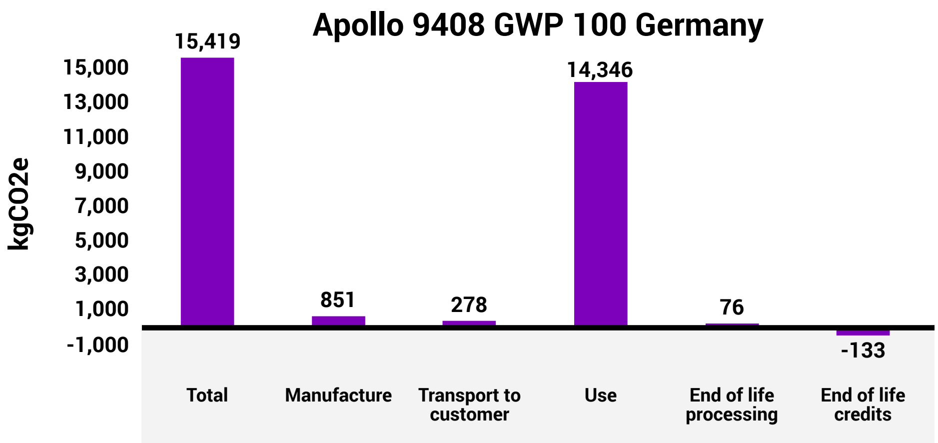


Figure 1. Lifecycle stage contribution to the GWP100 impact of a Ribbon Apollo 9408 deployed in Germany.

The manufacturing stage represents 6% of the lifecycle impact in Germany and 8% if installed in New York. Just under 1/3 of the manufacturing impact is derived from the production of the MPQ_8 card. Across the chassis and MPQ_8 card,1/3 of production emissions originate from printed circuit board production, with sheet metals use representing the next most significant individual contributor at 18%. The PSU comprises the next larges contributor at 10% of the manufacturing impact.

While the use phase impact is reduced if installing in New York, the transport impact increases by approximately 55% due to increased travel distance.

The configuration studied, may be the most common, but it does not utilize the full capabilities of the unit. By adding client and line optical cards the capacity can increase to 12.8 Tbps. The increase in energy consumption is approximately 532% from the studied configuration, while the capacity increased by 8 times. An intensity metric shows that the lifetime impact reduces from 9.6 kgCO2e/Gbps in the configuration studied to 4.3 kgCO2e/Gbps if the capacity is increased to 6.4 TBps. Therefore, the environmental impact intensity of the manufacturing and transport stages is reduced when the configuration utilizes the maximum potential of the unit.

Conclusion

The environmental impact of the Apollo 9408 in its most commonly purchased configuration is equivalent to the annual footprint of 2.2 German citizens in 2023 (link). The manufacture and transport stages are equivalent to 1.2 years of in-use impact, demonstrating that extending the lifetime of the product in the network to 20 years will reduce the overall impact compared to an updated product after 15 years.

Key Facts

- The use phase contributes to 93% of the lifetime emissions in Germany and decreases in countries with lower carbon intensity electricity networks
- The manufacturing stage represents 6% of the product carbon footprint in Germany, rising to 8% in New York.
- Printed Circuit Board production is the greatest source of emissions in the manufacturing stage
- The transport stage's impact is dominated by the air freight transport leg, which accounts for 99% of the transport emissions. This is due to air freight covering the longest distances, as well as being the most intensive transport mode used.
- Recycling of the products resulted in a reduction in the lifecycle footprint of 57 kgCO2e.
- The largest gains from recycling come from the recycling of metals. Gold is the single largest contributor, followed by the recovery of steel. Avoiding virgin copper, aluminum and cardboard production further enhances the recycling credits attributed to the product system.

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