# NETWORK PERFORMANCE & THE BUTTERFLY EFFECT

*Micro-level advanced electronic materials help deliver macro-impact.*

**As demands for greater bandwidth and faster speeds increase, the stress and strain on networks continues to grow. This ultimately impacts performance, reliability, and component life.**

### Internet Access/Traffic[1]

2016 44%

2021 48%

Internet Users % of Population

### Number of Devices[2]

50

Number of connected devices per home by 2021

### Data Speed[3]

2014 27.5 Mbps

2021 53.0 Mbps

### Processing Power[4]

**Moore's Law:** Processing power doubles every 2 years. Now it is doubling every 3.4 months.

Given the mammoth scale of network infrastructures, meeting these challenges and achieving next-level performance can depend almost entirely on incremental improvements at even the smallest component level. Working with Henkel can provide access to new and innovative materials needed to meet expectations and solve next-gen challenges.

## CHALLENGE 1:

REDUCE COSTS AND IMPROVE OPERATING EFFICIENCY.

As data speed and volume grow, operational inefficiencies and limitations increase cost and inhibit profitable growth.

**20%** DATA CENTER COSTS INCREASE 20% EACH YEAR[5]

### SOLUTION 1:

Advanced materials that enhance thermal management at the integrated circuit level can help network infrastructure performance. Thermal management in electronic components helps improve operating efficiencies and reduce costs (such as cooling and other OpEx costs).

## CHALLENGE 2:

IMPROVE NETWORK PERFORMANCE. OPERATE AT MAXIMUM BANDWIDTH AND SPEED.

Greater scale, increasing volume, and emerging innovations require better performance and faster speeds as data moves around networks.

NEW CAPABILITIES CREATE MORE NEEDS:

**5G HAS 10X FASTER DATA SPEEDS THAN 4G[6]**

### SOLUTION 2:

**Better Thermal Management (again)**
Advanced material solutions enable modules to dissipate more heat and reduce operational temperature by upwards of 5° C, which enables higher processing power, faster speed and greater bandwidth.

**-5° C** Across line card = Higher processing bandwidth and speed[7]

## CHALLENGE 3:

ACHIEVE NETWORK RELIABILITY AND DURABILITY TO MEET NEW PERFORMANCE REQUIREMENTS.

As demands on circuits increase, their long-term reliability and durability become just as important as any speed or performance requirements. Downtime is the bane of any network. In addition to reducing degradation from excess heat, the mechanical integrity of integrated circuits will help ensure reliability and durability by providing robust electric connections and enhanced component life.

**20%** OF IT BUDGETS ARE WASTED DUE TO UNDER-OPTIMIZED COMPONENTS AND DURABILITY AND MAINTENANCE ISSUES[8]

### SOLUTION 3:

- **Solder Materials:** When connections simply must not fail, innovative solder materials ensure performance with solid, reliable connections that power the network.
- **Underfills:** Prevent mechanical fatigue and extend the lifespan of components with the additional mechanical reinforcement that underfills provide.
- **Bonding Materials:** Enhance sub-component reliability, stability, and performance while reducing hardware weight and protecting against other mechanical stresses.

## CHALLENGE 4:

BUILD OPTICAL COMPONENTS TO LAST WITH STRONG, RELIABLE ELECTRICAL INTERCONNECTS AND MAXIMUM LIGHT TRANSMITTANCE.

Optimizing optical component performance is critical to boosting network speed and efficiency. Whether it's increasing the light transmittance properties that determine data transfer speed and efficiency or ensuring the reliability and durability of interconnects, Henkel can help.

**4x** 400 GBE IS FOUR TIMES AS FAST AS CURRENT 100 GBE[9]

### SOLUTION 4:

Strong, reliable interconnects, specifically for optical modules. Advanced materials deliver with high light transmittance, and the strong, stable, and precise alignment that optical transceivers require during assembly and throughout components' operational lifespans. Advanced coatings used in microTIMs can extend life, enhance reliability, and boost network reliability.

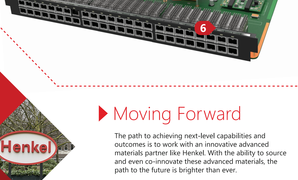
## Advanced Material Solutions

Advanced materials used in micro-sized electronic components hold the key to improving outcomes and delivering the next level of performance required for future innovation.

### They can be used on circuit boards like this:

**Advanced Materials Include:**

1. Thermal Gels
2. Phase Change Materials
3. Thermal GAP PAD® Materials
4. Solder Materials
5. Underfills
6. Bonding Materials




## Moving Forward

The path to achieving next-level capabilities and outcomes is to work with an innovative advanced materials partner like Henkel. With the ability to source and even co-innovate these advanced materials, the path to the future is brighter than ever.

Read More About:
WHY ADVANCED MATERIALS ARE KEY DETERMINANTS OF NETWORK PERFORMANCE

### References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