Ofcom's consultation on resilience guidance

Sky's response

March 2024

Summary

This is Sky's response to Ofcom's resilience guidance consultation. Consumers continue to become more and more reliant on communications services. This creates a growing need for stable and resilient infrastructure. As a communications provider, we consider resilience risks and principles in the way we design and operate our network. But each network is built differently, and each set of customers have unique requirements. This means that a 'one size fits all' approach to network resilience does not always work.

We appreciate that Ofcom wants to establish a set of common resilience principles but that can be limited by the need to cover a wide range of different circumstances, network architectures and customer needs.

In this response, we explain our view on Ofcom's proposals in the consultation, highlight where we consider that the guidance is not appropriate or proportionate, and offer practical examples about how good engineering and design can deliver Ofcom's goals. In particular:

- We generally agree with the proposals for power backup. But it is not clear how such proposals would be enforced on altnet providers that may not meet Ofcom's power resilience proposals.

- We consider that the proposals for three-plus degree fibre connectivity from Metro to core sites are unnecessary. Instead, Ofcom should focus on supporting next-generation upgrades to Metro sites, where existing sites have appropriate alternative approaches (such as backup arrangements) to ensure availability. Alongside this, Ofcom should continue to seek dual parenting for exchange backhaul sites.

- We consider that Ofcom's proposal that core meshing *"could mean resilient connections to four or more other core sites"* is unclear and unnecessary. Ofcom should focus on ensuring communication providers' core functions can withstand the loss of one or more core sites.

Sky's architectural approach to resilience

Sky agrees that networks should be designed in a way to reduce single points of failure, that automation and failover functionality deliver continuity of service, and that processes, tools and training should sit behind improvements in the actual physical architecture. In this section we explain how Sky's approach to resilience delivers effective and resilient outcomes. This will help situate Sky's response to Ofcom's specific questions set out below.

Network design and 'n+2' approach

Our default approach to network design is to deliver 'n+2' resilience for all critical network functions (connectivity and geo/cluster-resilience for critical sub-systems). [✂]

While this can be costly, it ensures that a high level of resilience is built into the network infrastructure which Sky owns and operates.

The 'n+2' approach is our general format for network design, but Sky also deploys more sophisticated approaches in parts of our core IP network. We use tools to war-game

potential failures, which allow us to determine how to upgrade the core network. This helps delivers a higher standard of resilience. For example:

- During peak hours where there is increased traffic on our network, Sky's intra-SuperCore links (including the mesh to Internet edge) will provide the resiliency required to ensure consumers are able to use their broadband service. [✂].

- Similarly, we apply a higher standard in relation to having multiple upstream IP transit providers. [✂]. This ensures service availability and performance meets customer expectations, even in the most challenging conditions.

Physical resilience

Improvements to physical resilience must take account of future plans and network design. Sky applies a 'resilient-by-design' principle which means that whenever a major design milestone is reached, we aim to implement a step function improvement in resilience. [✂].

In relation to our PoP Sites, we have created a model which removes the risk of any active components becoming single points of failure. This was a deliberate step to ensure that even events such as out of hours maintenance have little or no meaningful impact on customer services. The upgrade has resulted in demonstrable improvements in availability year over year as we have rolled out the new design, including a reduction in both quantity and scale of incidents. [✂].

Planning

We are also making rapid progress in planning activities to increase resilience in our network. This means we have high confidence in our ability to deliver full connectivity to customers at the busiest times and when there are outages. While third parties are beyond our direct control, Sky's planning includes increased direct bilateral planning activities with major traffic sources and/or Internet fabric infrastructure providers (e.g. AWS, Google, Akamai, Azure). Planning allows us to identify network elements with lower resilience so that we can take pre-emptive action to address issues.

Automation

Sky uses data science techniques to improve automation of resilience and fault management. Automation allows us to better allocate physical and logical resources to reduce the risk of performance or availability issues during scheduled network changes. Our ticket automation portfolio allows us to identify and manage fault conditions more efficiently so that engineers can quickly focus on the underlying problem. The result is a steady improvement in our Mean Time to Detect (MTTD) and Mean Time to Repair (MTTR).

Data analytics

Behind our planning and automation programmes is the leveraging of telemetry, alerting, and log data as crucial inputs for analytics models. These models play a pivotal role in conducting root cause analysis and predicting potential future failures. Telemetry data provides us with near real-time information on the health and status of various components and services, allowing us to identify and address issues before they escalate. [✂]. Log data will serve in the future as a valuable source of information for incident management through revealing patterns indicating underlying issues or inefficiencies.

Resilience of physical infrastructure domains (Q1)

Question 1: Do you consider the measures in the proposed guidance relating to the resilience of the physical infrastructure domains to be appropriate and proportionate?

Sky's approach to physical infrastructure resilience has been developed from practical experience and responds to the needs and expectations of our customers. We outline the approach below with reference to the specific guidance measures proposed by Ofcom. Sky believes that the measures we are taking are appropriate and proportionate to the risks they mitigate, and the circumstances we face.

Access/Last Mile (4.2.1) and Aggregation/Backhaul (4.2.2)

Ofcom's proposals set out power backup ambitions in the access and aggregation/backhaul domains.

Sky believes that these proposals are broadly sensible but could pose risks to market breadth if applied too forcefully.

Sky should not be limited from entering into wholesale agreements to buy access services from altnet providers that do not meet Ofcom's power resilience criteria. From an end-user perspective, maximising choice of retail service providers is likely to be of higher benefit than prohibiting retail providers from consumer access network services that are deemed insufficiently resilient. Instead, we would propose ensuring power resilient new build or retrofitting over time in the access supply chain as a more proportionate solution.

Ofcom also wants communications providers to ensure that access network equipment or locations address the risk of single points of failure, in cases where greater resilience is appropriate, which Sky agrees with. We note that these resilience risks lie in the Openreach domain, outside of Sky's control. In addition to Ofcom's proposals, we would suggest further measures could be taken to reduce single point of failure risks to service availability for Openreach's wholesale customers. For example, more proactive Openreach-led legacy LLU exchange closure would advance the concentration of end customers at Openreach GEA handover points. This would ensure improvements to resilient active handover and estate mechanical and electrical ("M&E") would be consistent and targeted at a smaller footprint, with the added benefit of reduced costs to Openreach. This resilience and consistency does not exist today.

Core/Metro (4.2.3)

Three-plus degree fibre connectivity

Ofcom's proposals include provision for three-plus degree fibre connectivity from Metro-PoP to core sites.

Sky considers that this is unrealistic and unnecessary. [✂]. Importantly, availability for end-users is not dependent on adding more than two fibre routes into our PoP sites. In our 18-year experience in the UK broadband market, Sky has never lost connectivity with a PoP site due to insufficient routes. We broadly consider the WDM/Fibre layer for a given PoP to

be "5 9s" (i.e. 99.999% which equates to an average of less than 6 minutes downtime per year) with real world availability governed by change volume, occasional control plane issues, and localised physical failure such as in the access network.

In cases where our analysis reveals substantially lower theoretical availability, and where we can take action, we do provide increased resilience. [✂]. We also work to upgrade geographic resilience where feasible. [✂].

However, alternative approaches are likely to be more effective for improving customer availability than simply adding fibre degrees to PoP sites, such as dual parenting of exchange backhaul sites. Once all connected exchanges are dual parented, additional PoP fibre and power resilience will have negligible benefits as the connection back to different core sites will ensure automatic failover to preserve service continuity. Where dual parenting is not technically possible, this is likely to be at the same PoP sites where it would be most difficult to add additional fibre degrees (owing to geographical constraints).

We therefore recommend that Ofcom focus its guidance on next-generation upgrades to Metro sites, where existing sites have appropriate alternative arrangements to ensure availability. Alongside this, Ofcom should continue to seek dual parenting for exchange backhaul sites.

Core meshing

Ofcom also proposes that core meshing *"could mean resilient connections to four or more other core sites"*. Sky considers that this wording is unclear and the proposal is unnecessary. [✂].

Uninterrupted service due to loss of Metro site

Ofcom proposals include uninterrupted service in case of loss of a Metro site. Sky considers that there are elements of this which are often unrealistic, especially for existing sites. We agree that the M&E services at these sites should naturally meet certain standards, generator backup should be available, and there should be full resilience at the IP/WDM layer for the site. Sky considers that these measures, plus business and residential mobile backup solutions, deliver the necessary level of resilience needed for a worst-case scenario of metro site failure.

We would instead recommend a requirement that providers ensure geographical resilience when they reach major architectural inflection points. This would mean resilience improvements align with new generations of technology and equipment as Metro sites are upgraded. Ofcom could also consider our business-to-business (B2B) approach, where services are offered with options for customers to terminate connections at geographically diverse Metro sites, ensuring further resilience.

Dual resilient mains power connections

Ofcom also proposes dual resilient mains power connections for each core site.

Sky considers this is unlikely to be feasible for retrofit at all sites as it will require a diverse electricity feed from the building to a completely separate substation. Dual resilient mains power connection is a measure that the market is not able to meet when looking for geographically distributed sites outside major cities. If mandated, the measure could even make securing additional metro POPs for exchange dual parenting unviable. As such, the

use of local generators is a better backup solution and therefore suggest this measure be removed.

Finally, Ofcom's proposals also need to consider the impact of measures on vendors of network equipment and services. Any changes that we seek to make will have to be agreed with third parties. As the Telecoms Security Act experience has shown, this can be complex and challenging. Guidance on physical network resilience should bear this in mind and Ofcom should seek to engage with vendors directly on resilience proposals to better inform its regulatory approach.

Resilience of other domains (Q2-5)

Question 2: Do you consider the measures in the proposed guidance relating to the resilience at the Control Plane to be appropriate and proportionate?

Ofcom set out a range of measures related to the Control Plane. Sky broadly agrees with Ofcom's proposals. However, there are two areas where we believe amendments would be helpful.

First, the proposed guidance is selectively prescriptive with references to isolated specifics (for example, in relation to the BGP features to be used). Sky asks that the guidance instead allow for appropriate and proportionate steps to be taken with respect to such features.

Second, Ofcom makes specific proposals for segregation of infrastructure and customer Domain Name Systems (DNS). [✂]. If these proposals are to be included in final guidance, then providers must be given sufficient time to implement the required changes.

Question 3: Do you consider the measures in the proposed guidance relating to the resilience of the Management Plane to be appropriate and proportionate?

Ofcom set out a range of measures related to the Management Plane. Sky broadly agrees with Ofcom's proposals. However, as for Control Plane measures, improvements could be made.

The stipulations around in-bound management are unnecessary and over-prescriptive. For example, logical separation may be unnecessary, not least given the ongoing changes being made by providers to their management planes as a result of the Telecoms Security Code of Practice. We suggest that this be removed from the final guidance.

Question 4: Do you consider the measures in the proposed guidance relating to communications providers' own managed services to be appropriate and proportionate?

Ofcom set out a range of measures in relation to "CP-managed services". This includes noting the immaturity of telco cloud when it comes to features such as security and resilience.

Sky broadly agrees with the proposed Ofcom guidance in this section. However, communications providers have limited control over the move towards different forms of cloud-native technology, given the competitive market we operate in and, as Ofcom notes, the advantages cloud provides. We understand the current maturity challenges with

nascent cloud technologies, but these are challenges that can be practically addressed through learning and development in our environments.

Sky recommends that Ofcom's comments on cloud immaturity with respect to security and resilience should be nuanced, to make clear they represent a moment-in-time snapshot rather than an obstacle to cloud deployment.

Question 5: Do you consider the measures in the proposed guidance relating to communications providers' arrangements for preparing for adequate process, skills and training to be appropriate and proportionate?

Yes.

Conclusion

Sky is proud of the work and innovation we have delivered to achieve greater resilience and reliability in our network and services. This work helps ensure that our networks are robust, available and work well. We continue to invest in network modernisation, incorporating resilience at the design horizon. Our forward programme will build on successful experiences across the UK to remove single points of failure over the coming years. Sky agrees with Ofcom that guidance will help providers implement measures that are necessary to fulfil legal duties and must avoid over-prescription.

However, Ofcom must also recognise the limits and trade-offs we now face. Sky's transition plans are already ambitious as we act to meet the needs of our customers. Our roadmap for network changes already incorporates requirements set out by public authorities, including the extensive programmes underway to remove Huawei equipment and meet challenging new security regulations. Moving further or faster would substantially raise the risks of failures in our network and lead to poor outcomes for our customers; such as reduced availability, degraded performance and poorer functionality. Any costs added to our existing programme would also have a severe impact on Sky's ability to sustainably develop future network resilience. We request that Ofcom takes account of these realities in its final guidance.

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