HEAVY READING

WHITE PAPER

The State of Fixed-Mobile Convergence

A Heavy Reading white paper produced for Intel

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INTRODUCTION

Service providers (SPs) have been interested in delivering services in a holistic services environment for some time. However, accomplishing this has traditionally been difficult, given the architectural differences between mobile, fixed, and cable networks. This is changing today due to the availability and maturation of cloud-native software-based solutions. In the cloud-native world, software can be deployed in any network on shared platforms, which means that achieving the tangible benefits of fixed-mobile convergence (FMC) services is now within reach.

Consequently, progressive SPs of all types are implementing strategies to commercialize FMC to achieve service differentiation, optimize network performance, and remain relevant in an evolving cloud-centric competitive landscape. To successfully complete this FMC journey, SPs need to devise effective and pragmatic strategies, address challenges related to common stack service delivery, and rationalize platform requirements and critical standards and specifications.

To understand these network requirements, as well as document the initial FMC use cases that will drive FMC monetization, Heavy Reading partnered with Intel to create a comprehensive survey designed to deliver granular insights in these areas. This white paper presents and analyzes the results of this survey.

SURVEY DEMOGRAPHICS

The survey, launched in 3Q21, collected qualified responses from 86 SPs around the world, with converged operators with both fixed and mobile networks making up the largest distribution (65%). Only SPs with tangible FMC deployment plans were invited to take the survey. These respondents worked for SPs from all around the world. The percentage distribution of respondents was as follows:

- US: 36%
- Canada: 4%
- Central/South America: 4%
- Western Europe: 27%
- Central/Eastern Europe: 9%
- Asia Pacific: 9%
- Middle East: 7%
- Africa: 2%

Survey respondents performed a range of roles within their respective companies. These included technical roles such as cloud and IT (36%), network planning (16%), R&D (15%), network operations (13%), sales and marketing (7%), and corporate management (5%).

They also worked for SPs of various sizes. Large SPs generating at least $5bn in annual revenue led with 38% of respondents, but all groups were well represented. For example, in second place with 21% of respondents were companies generating $200m–$499m in annual revenue. The remainder were spread among smaller companies with less than $200m in annual revenue (15%) and companies that fell into the $500m–$5bn annual revenue range (26%).

USE CASES AND DRIVERS

The first question in the survey addressed the timeline for SPs to address FMC. As shown in **Figure 1**, they are making considerable progress. 48% are currently deploying some form of FMC, with 41% planning to deploy FMC in the next 12–18 months. The remainder (12%) plan to deploy in 19–24 months.

While these inputs denote a strong level of commitment to deploying FMC within the next two years, it is also important to reinforce that only SPs with plans to deploy FMC could take the survey. Still, while Heavy Reading anticipated that a considerable number of "we are deploying now" responses would be received, the notable percentage of 48% was greater than expected and illustrates that FMC deployments are advancing at an aggressive pace.

Figure 1: FMC implementation timeline

We are deploying now	48%
We plan to deploy in the next 12–18 months	41%
We may deploy in the next 19–24 months	12%
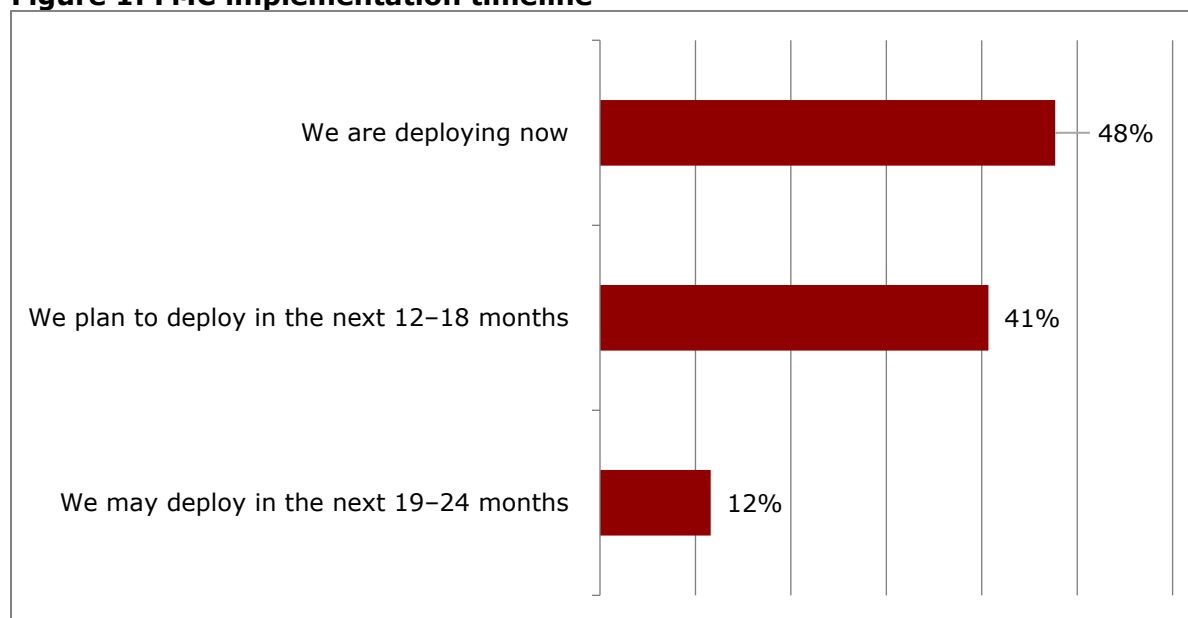
Question: What is your organization's timeline for FMC deployment? (n=86)
Source: Heavy Reading

Understanding the factors fueling the desire to implement FMC was also important. As shown in **Figure 2** below, based on "critical" input, there is a broad range of factors in the mix. The lead consideration is operational savings (48%), which is logical given the overhead SPs must support to deliver services and operate networks in the specific fixed or mobile network domains.

But other factors such as enhanced subscriber experience (43%), capex optimization/ savings (42%), and enhanced service delivery and innovation (35%) cannot be discounted. Interestingly, the smallest number of respondents (31%) link FMC to their 5G business case.

Heavy Reading interprets this data as confirming that SPs perceive a multidimensional range of opportunities with FMC that span operational savings and enhanced customer experience in part due to enhanced service innovation. In other words, FMC is beneficial for the customer, beneficial for the network, and ultimately beneficial for the bottom line.

Figure 2: FMC drivers
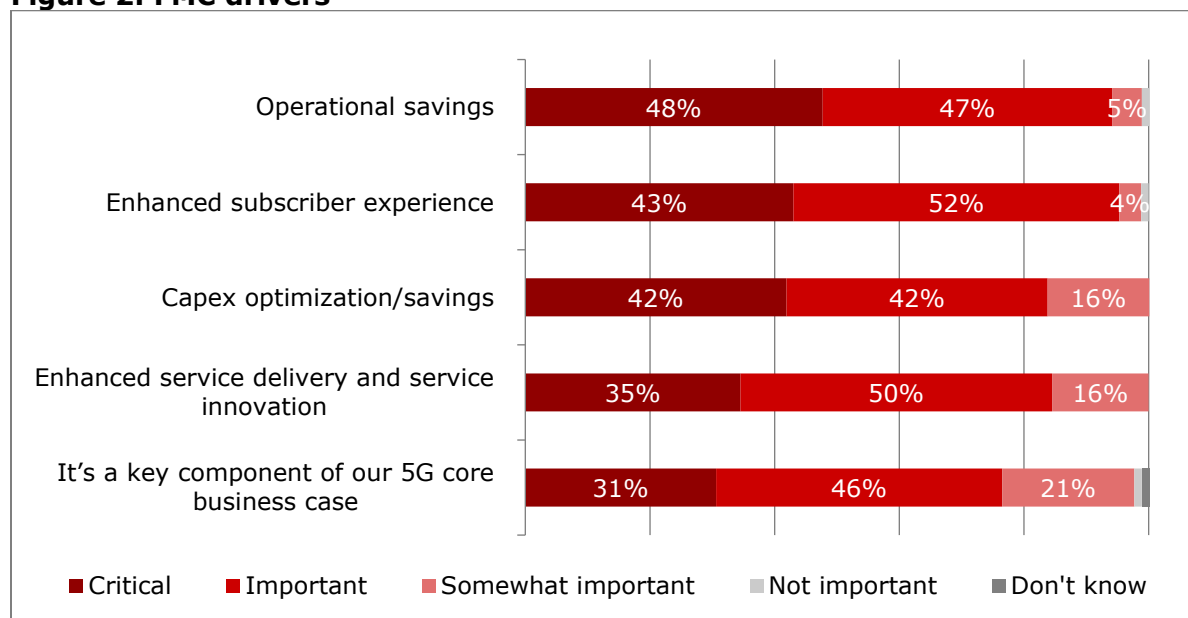
Question: How important are the following FMC drivers to your organization? (n=84–86)
Source: Heavy Reading

The next question was designed to help quantify this impact on the bottom line. In order to assess this impact, the survey respondents were asked to provide input matching FMC hardware, assurance, and security attributes to a savings range of 0% to greater than 30% within two years of commercial deployment.

The timeline of two years was chosen since it was anticipated that savings would become clear only after 24 months of commercial experience. As **Figure 3** below shows, SPs are forecasting considerable savings. On the upper end, the top three choices in the 21–30% savings range are a single hardware platform (28%), a single security policy team (26%), and a single network monitoring team (23%).

These three also lead in the greater than 30% savings range, with common service assurance solutions also scoring highly (12%). This input reinforces that the ability to run a common network on common hardware with a single security and monitoring team is a game-changer from a savings perspective.

Figure 3: FMC savings
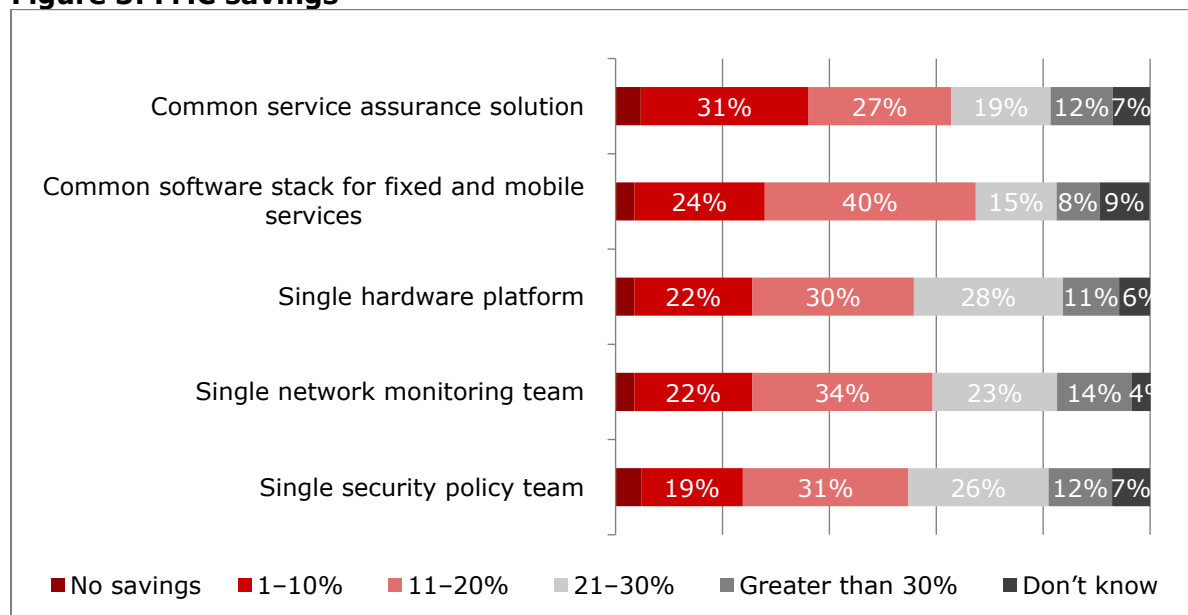
Question: What level of savings do you expect FMC to deliver within two years of commercial deployment for each of the following? (n=84–86)
Source: Heavy Reading

While savings are important, successful services must also deliver strong revenue growth performance. Accordingly, Heavy Reading asked the respondents to estimate the percentage of revenue growth that FMC services would deliver within two years of commercial deployment. As shown below, the greatest number of respondents (42%) believe that 11–20% revenue growth could be achieved.

The second group (28%) of estimates fell into the 1–10% group, while 19% predicted a more bullish 21–30% revenue growth curve. Heavy Reading views these revenue growth projections as reasonable and achievable.

- No revenue growth: 2%
- 1–10%: 28%
- 11–20%: 42%
- 21–30%: 19%
- Greater than 30%: 1%
- Don't know: 8%

An important consideration that affects revenue estimates is market rollout and network coverage. The rollout of new network capabilities rarely follows a "flash cut" networkwide approach. Instead, they roll out in markets with the greatest number of subscribers to maximize revenue potential.

The related and tricky part of justifying the business case then is understanding the percentage of subscribers required in these markets to make the investment business case profitable. When Heavy Reading asked the respondents this question, the top two groups

were 11–20% (37%) and 21–30% (27%). We also view this input as reasonable given the respondents are forecasting modest revenue growth potential.

- 1–10%: 11%
- 11–20%: 37%
- 21–30%: 27%
- Greater than 30%: 19%
- Don't know: 7%

The final two considerations in the creation of a technology business case are identifying and prioritizing the service-related use cases to be implemented as well as determining when the foundational subscriber-related capabilities enabling these services will be implemented.

As **Figure 4** shows, based on intent to implement during the initial FMC rollout phase, the respondents see several vital foundational capabilities. The top two leaders are the common security policy enforcement model (52%) and the single authentication model (48%), which will assist in the delivery of the common security policy enforcement model.

The level of support for the next three—multi-access voice convergence (37%), seamless failover, and creation of single-user persona (both 35%)—scored highly enough in Heavy Reading's estimation to warrant being considered as important foundational capabilities as well. Also notable is the fact that seamless failover attained the highest score in the "implement in a subsequent implementation phase" category (54%).

Figure 4: FMC capabilities
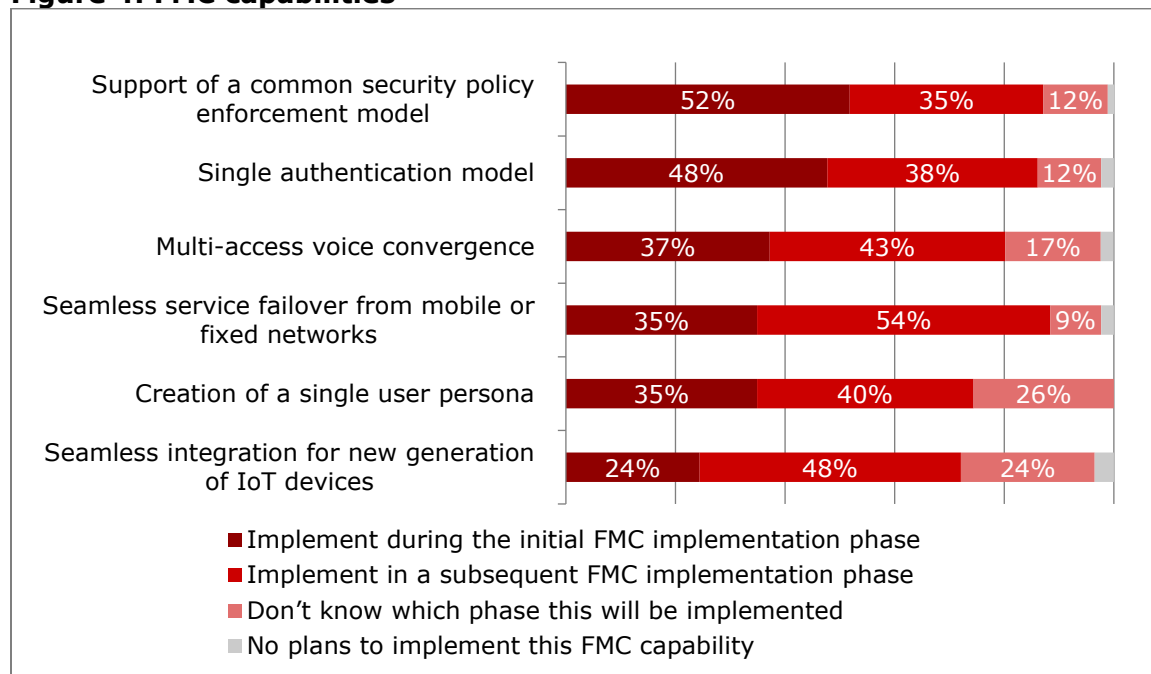
Question: When will the following subscriber-related FMC capabilities be implemented in your organization? (n=85–86)
Source: Heavy Reading

The next and final question in this section of the survey addressed which FMC use cases SPs would implement to meet projected revenue generation estimates. The inputs illustrated in **Figure 5** provide valuable insight.

As captured, the leading FMC use case in a revenue context is the delivery of harmonized fixed and mobile enterprise services (including services such as unified communications (UC; 54%). This was not unexpected, given enterprise services traditionally generate higher revenue than residential services and there has been a long-standing clamor from the field for enterprise customers to have a single harmonized access model.

In second and third place were use cases addressing new service tiers of existing services (51%) and, somewhat surprisingly given the input in **Figure 4** above, seamless integration for a new generation of Internet of Things (IoT) devices (49%).

While not in the top three, all the other use cases Heavy Reading presented garnered considerable levels of support in a very tight grouping range (38–41%). These include universal access to media streams (41%), network slicing for fixed access subscribers (40%), and access-agnostic private networks (40%), followed closely by universal security service tier and network-agnostic single stack services (both 38%).

Like the foundational capability rankings illustrated in **Figure 4**, Heavy Reading interprets the narrow range of scores as confirming multiple use cases that represent strong candidates for maximizing revenue generation are in play.

Figure 5: Ranking FMC use cases
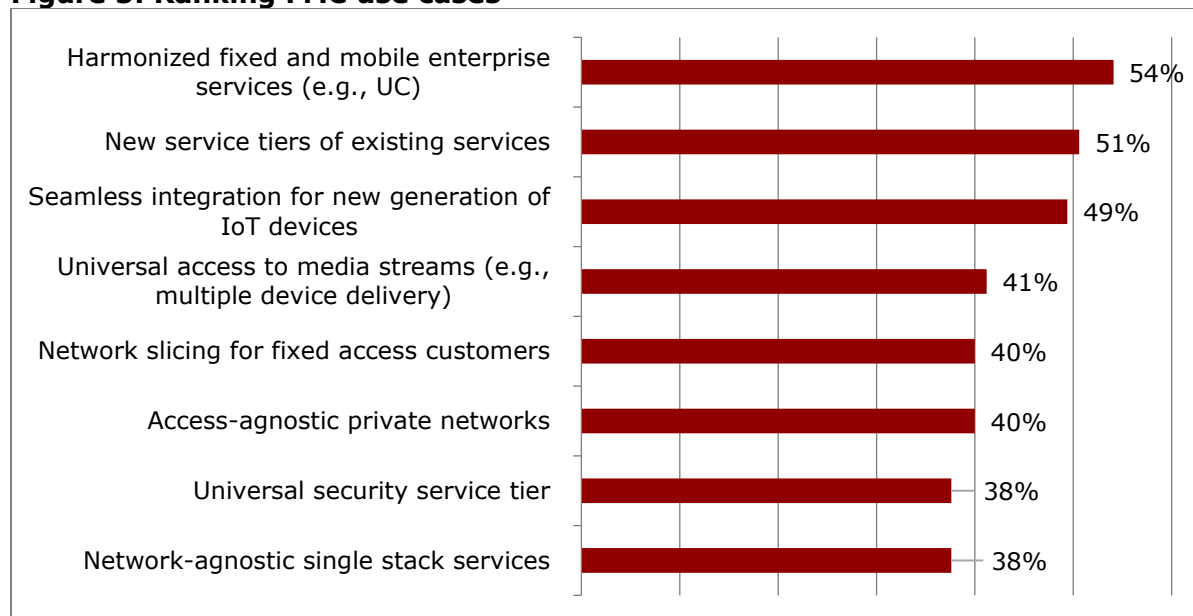
Question: Which of the following FMC access-agnostic use cases do you believe will generate the most revenue? (n=86)
Source: Heavy Reading

COMPONENT REQUIREMENTS AND IMPLEMENTATION CHALLENGES

The next section of the survey investigated FMC component requirements and implementation challenges.

To initiate discussion, the respondents were first asked to agree or disagree with three FMC statements related to operations, the relationship to 5G core deployment, the impact of the competitive landscape, the consolidation of solution delivery teams, and the availability of 5G residential gateway (RG)-enabled CPE required for fixed FMC services. There are a couple of interesting observations based on the input captured in **Figure 6**.

The first observation is that while the 5G business cases were not perceived as a critical FMC driver (see **Figure 2**), 64% agreed they would not deploy FMC until their 5G standalone (SA) core was deployed. In contrast, only 39% agreed they would not deploy FMC until they had deployed 5G RG-enabled CPE.

The response level for the next statement was not unexpected. It was assumed that a sizeable number of SPs would not deploy FMC until there was a competitive reason (58%) to do so. But even here, 42% disagreed they would not rely on competitive forces in their FMC rollout, likely because they are looking at FMC operational savings (see **Figure 2**).

The final statement related to creating a single operations delivery team shows a significant split, with 54% requiring a single team while 46% do not.

Figure 6: FMC deployment impact factors

	Agree	Disagree
We will not deploy FMC until we have our 5G SA core deployed	64%	37%
We will not deploy FMC until there is a competitive reason to do so	58%	42%
We will not deploy FMC until operations teams (fixed and mobile) are converged to create a single solution delivery team	54%	46%
We will not deploy FMC until we have deployed 5G RG-enabled CPE	39%	61%

Question: Do you agree or disagree with the following statements (n=85)
Source: Heavy Reading

Documenting FMC implementation challenges was also a key focus area of this research project. To understand the scope of challenges, the respondents were asked to assess a list of potential challenges on a scale of "major challenge" to "not a challenge." The results in **Figure 7** below provide several important insights.

The first observation is the range of "major challenges" for many of the inputs falls into the 11–18% range, which is interpreted as a positive in that only a relatively small group of the respondents feel these are major challenges.

The two that stand out as noteworthy are security-related challenges (28%) and billing and provisioning (27%), both of which represent significant concerns and cannot be ignored.

The security-related challenges are especially concerning since they also scored highly in "challenge" responses (40%). While SPs are looking to FMC to deliver a single security model (see **Figure 4**), this input captures the crux of the FMC dilemma they face. A harmonized security model and security-related use cases are viewed as strategic imperatives, but all things security-related are also among the most challenging to implement successfully.

Also of note is that operational challenges also attained the highest number of "challenge" responses (66%) by a considerable margin versus the range of all other inputs (25–48%). This is interesting given SPs also largely split on whether they need to create a single operations team before implementing FMC (see **Figure 6**), which would presumably simplify the challenge resolution process.

Figure 7: FMC implementation challenges

	Major challenge	Challenge	Somewhat of a challenge	Not a challenge	Don't know
Security-related challenges	28%	40%	29%		2%
Billing and provisioning	27%	25%	41%		7%
Cultural challenges (resistance to creation of a common FMC team)	18%	28%	39%	14%	
Maturity of vendor solutions	17%	46%	27%	8%	
Operational-related challenges	14%	66%	18%		2%
Sales and marketing-related challenges (e.g., inability to upsell or achieve service differentiation)	13%	48%	27%	12%	
Regulatory compliance	12%	46%	32%	11%	
Lack of support from executive team	11%	35%	26%	27%	

Question: How challenging do you expect each of the following to be in your FMC rollout? (n=84–85)
Source: Heavy Reading

The FMC architecture introduces several new components designed to provide seamless and access-agnostic connectivity. These include the user plane function (UPF), which supports packet routing and forwarding, and the access gateway function (AGF), which supports connecting an existing wireline network to a 5G core network. These components can also be implemented as a combined UPF/AGF node to simplify network implementation.

Depending on operator type and specific service requirements, FMC may also require the implementation of additional components such as virtual cable modem termination systems (vCMTS) to support coaxial access networks. **Figure 8** provides insight into the platform priorities.

One key observation is that since the greatest range of inputs (33–58%) fall into the "will likely implement" range, it is clear that many SPs are still mulling over their architecture requirements.

In those cases where SPs have opinions based on "will implement" inputs, the top three preferences are to implement a UPF (34%), a combined UPF (25%), and a CMTS with the fixed-mobile interworking function (FMIF; 20%). The FMIF is required to interwork fixed line subscriber traffic with the 5G core.

In fourth place was the 5G core access traffic steering switching splitting (ATSSS) component function (19%). The ATSSS is a strategically important component since it enables traffic steering over both mobile and fixed networks and therefore plays a role in how edge compute resources are utilized (see **Figure 13**).

Figure 8: FMC network components
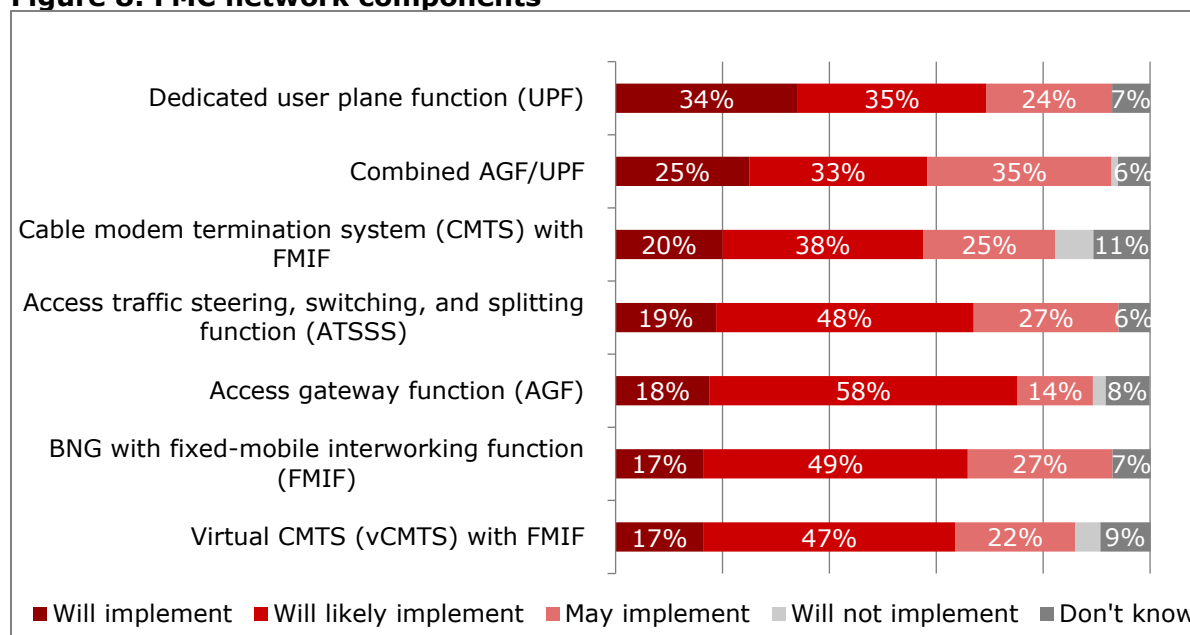
Question: How likely is your organization to implement the following FMC network components? (n=84–85)
Source: Heavy Reading

In addition to deciding which FMC components to implement, SPs must also decide on which platforms they will utilize for these implementations. When Heavy Reading asked the respondents for platform preferences to support FMC user plane functions such as UPF/AGF, the preferred approach by a considerable margin was to utilize a cloud-native platform (42%).

The remainder of the respondents were deadlocked on using either an existing legacy platform or a merchant silicon-based solution (both 28%).

FMC AND THE CLOUD

Although the selection of cloud-native as the top platform option was not unexpected, the level of support confirms that the cloud will play a significant role in shaping the evolution path of FMC services. One key related factor is the ability to leverage the "as a service" scale metrics of cloud partners.

Since cloud-native platforms run services in containers to minimize overhead, by default they are cloud services and can work with cloud partners to gain access to services such as container as a service (CaaS). The value of CaaS is that it supports low cost compute and hosting, thereby avoiding the costs and complexity of managing and monitoring containers on local compute infrastructure. When Heavy Reading asked the survey respondents who preferred cloud-native platforms if they would support CaaS, a resounding 92% said they would.

Exploring this topic further, we asked the survey respondents which hyperscaler partners they would prefer for CaaS. As **Figure 9** illustrates, the top choice was Microsoft Azure (59%), followed closely by Amazon Web Services (AWS; 56%). Behind these two were a tightly grouped pack of Google Cloud and Red Hat (both 35%) and VMware (32%).

**Figure 9: Ranking CaaS providers**
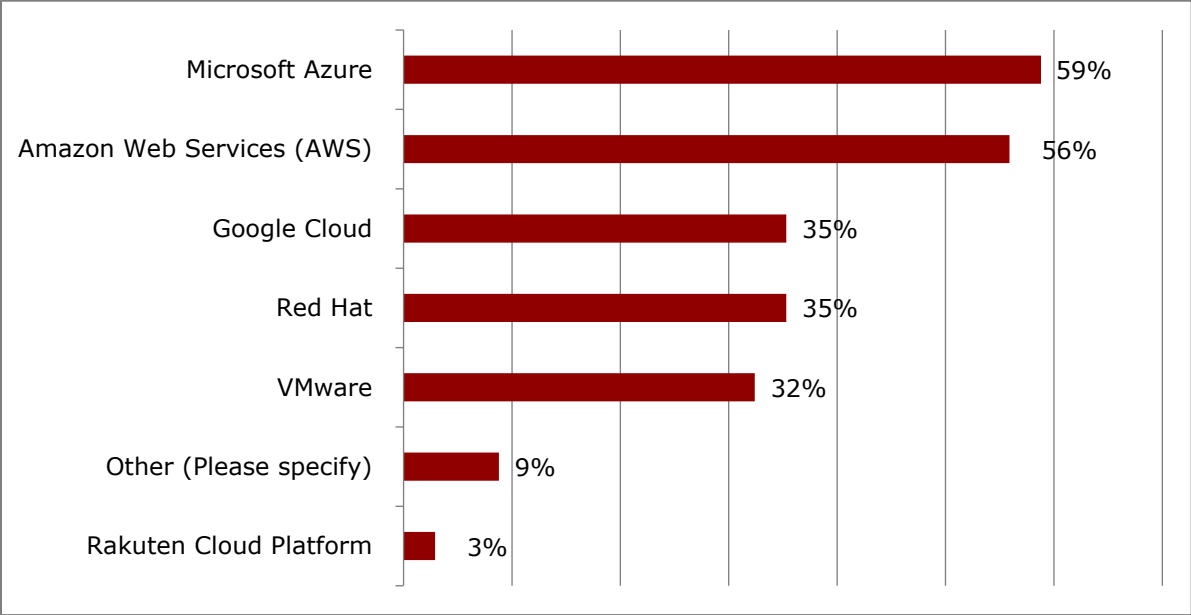
Question: Which CaaS providers will support your deployment? (n=86)
Source: Heavy Reading

But the cloud can offer many more capabilities than simply CaaS that will enhance FMC performance. As **Figure 10** below documents, cloud storage leads the way with a 49% "will implement" response rate, followed by cloud orchestration and analytics (38%) and cloud compute and cloud hosting-network core (both 37%).

Heavy Reading expected a close ranking of capabilities since we consider these capabilities to be essential cloud capabilities apart from cloud consulting services. As anticipated, the latter achieved the lowest implementation score (18%) and the highest "will not implement" score (33%).

**Figure 10: Cloud capabilities**
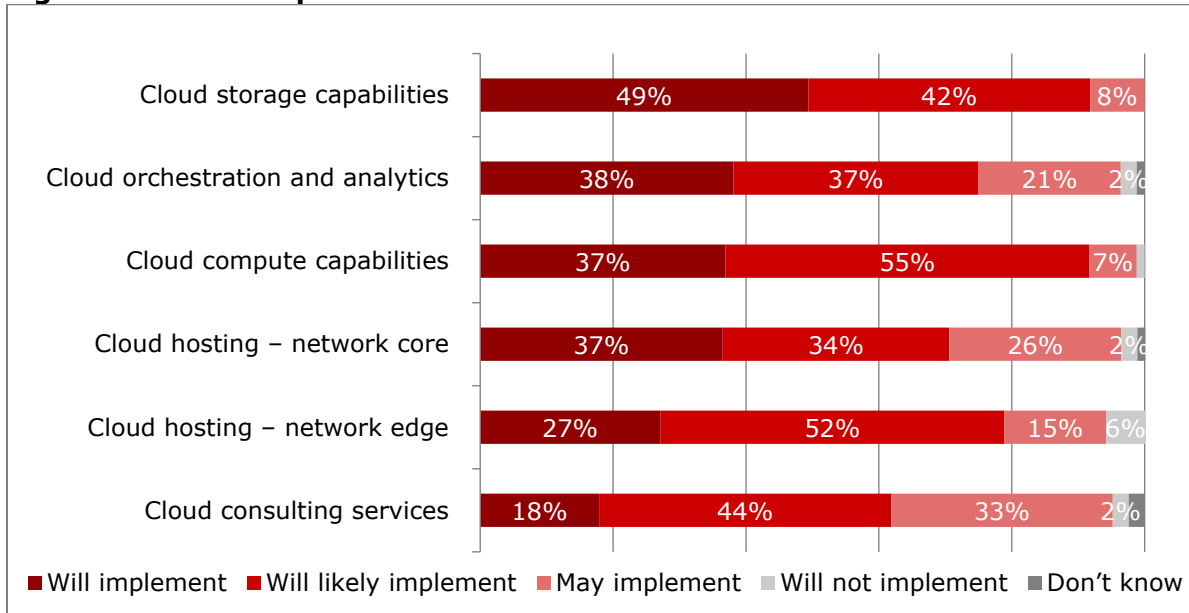
Question: How likely is your organization to implement the following cloud services to support your FMC deployment? (n=84–85)
Source: Heavy Reading

The final question in this section of the survey provided a definitive view of which cloud SPs would partner with for their FMC network components.

Based on "already a partner" input, as shown in **Figure 11** below, AWS leads by a considerable margin (44%), followed by Microsoft Azure (36%) and VMware (26%). While Google Cloud came a distant fourth (22%), it did attain the highest percentage of "will partner" inputs (36%), suggesting that its future as an FMC cloud components partner has yet to fully play out.

Figure 11: Preferred cloud partners
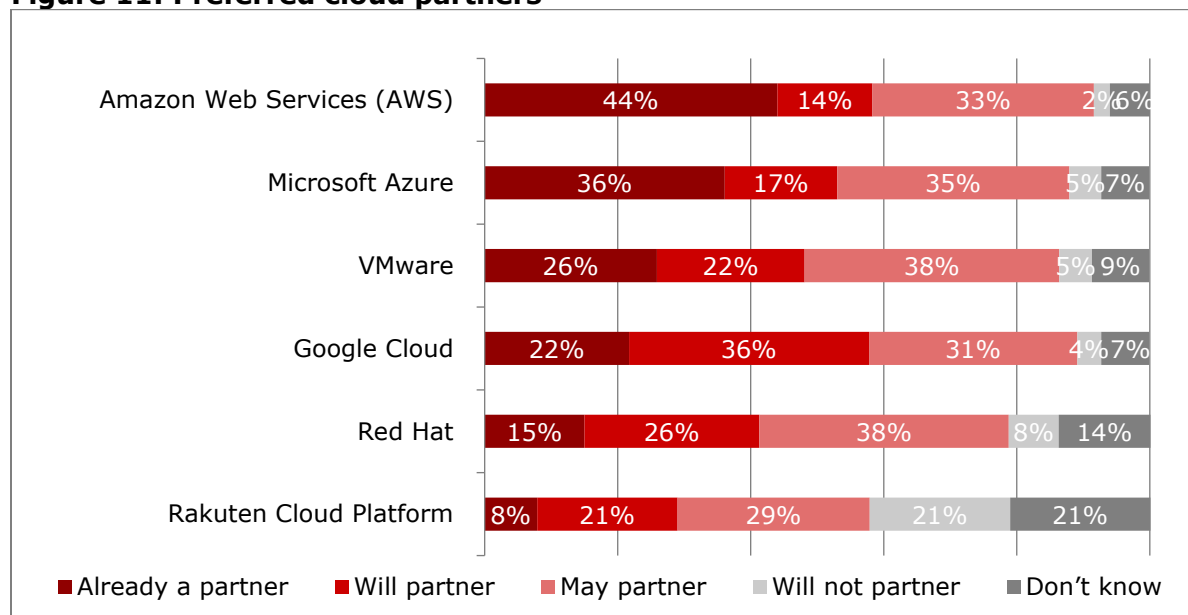
Question: Which cloud service provider(s) will your organization partner with for the FMC network components? (n=76–84)
Source: Heavy Reading

VENDORS, STANDARDS, AND THE EDGE

The final section of the survey focused on FMC vendor preferences, the impact of standards, and all things edge.

As documented in **Figure 9** and **Figure 10**, hyperscalers such as Amazon and Microsoft Azure will play a role in supplying FMC *cloud-native* capabilities. However, as **Figure 12** below confirms, they are not poised to be the lead vendors in a total FMC vendor universe—at least not yet.

As the figure captures, SPs are more willing to work with vendors that supply fixed network components such as the broadband network gateway (BNG; 42%) or mobile network core component suppliers (25%) before hyperscalers (18%).

The strong showing of fixed network component vendors was somewhat surprising, given 64% of the survey respondents linked FMC implementation to 5G core availability from their wireless vendors (see **Figure 6**).

One factor likely in the mix is that fixed network components vendors are traditionally strong in understanding enterprise and residential services, which would be invaluable in creating harmonized high value use cases (see **Figure 5**).

Figure 12: FMC vendor preferences
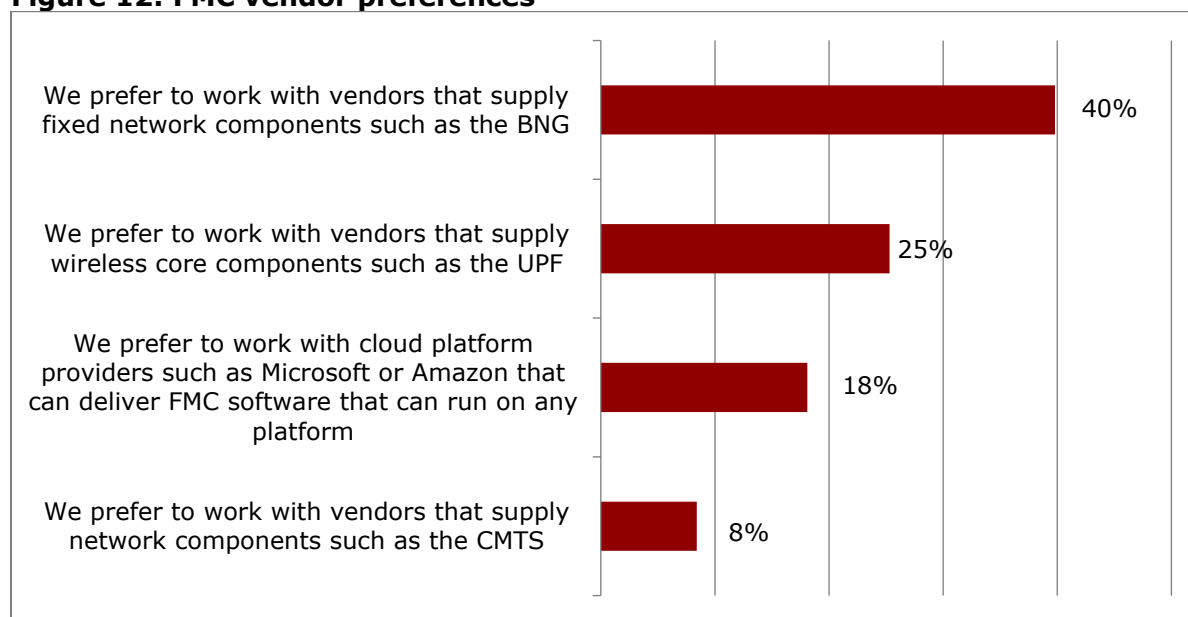
Question: Which statement best describes your organization's FMC solution vendor preference? (n=83)
Source: Heavy Reading

As noted in **Figure 8,** ATSSS achieved a fourth-place ranking in terms of implementation commitment. However, as **Figure 13** illustrates, more than half of the respondents (54%) intend to support *edge-based* ATSSS traffic steering capabilities in their FMC implementation plans.

This input confirms that SPs view the addition of powerful capabilities such as traffic steering at the edge as a vital component for enabling the blending of fixed and mobile low latency, high value services.

Figure 13: Implementing edge-based ATSSS

	Percent
We will support edge traffic steering	54%
We will not support edge traffic steering	19%
We may support edge traffic steering	20%
Don't know	7%

Question: Which statement best describes your organization's view of the importance of utilizing edge-based (e.g., ATSSS) traffic steering capabilities in your FMC implementation? (n=85)
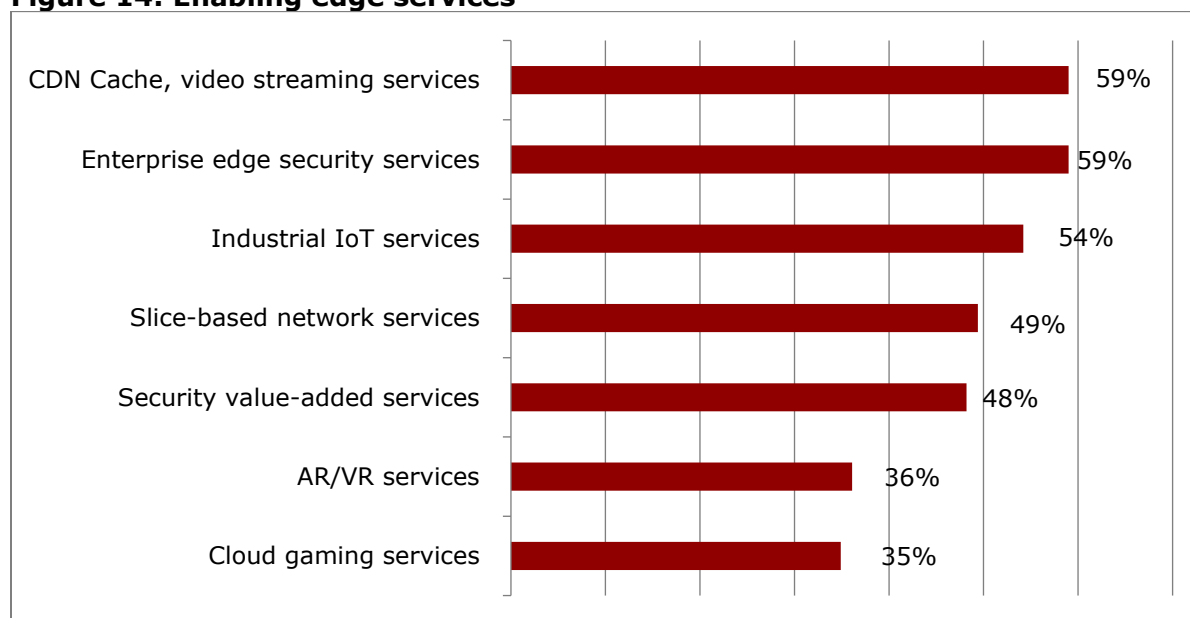*Source: Heavy Reading*

Figure 14 provides insight into the actual high value services that SPs want to utilize ATSSS for to enable service innovation at the edge.

As the figure captures, tied for first place are content delivery network (CDN) cache and video streaming services and enterprise edge security services (both 59%), followed closely by Industrial IoT services (54%). Rounding out the top five with significant support are sliced-based network services (49%), which unquestionably will thrive at the edge, and security value-added services (48%).

The strong support for video streaming was not surprising, given video streaming will be a vital component for any service at the edge.

The equally strong level of support for using ATSSS to enable enterprise edge security services and even security value-added services is logical and consistent with SPs' high ranking of the value of implementing a single common security policy enforcement model (see **Figure 4**).

Figure 14: Enabling edge services

Question: Which traffic services will ATSSS based edge traffic steering help enable? (n=86)
Source: Heavy Reading

Since FMC by nature represents an amalgam of fixed, mobile, and even cloud services, a number of standards bodies have been active in undertaking the creation of specifications necessary to seamlessly support interworking in an access-agnostic environment.

When asked to rank the various standards bodies based on the importance of their specifications, the clear leader based on "critical" inputs was the Broadband Forum (BBF) (36%), which is driving the fixed network specifications. In second place was the 3rd Generation Partnership Project (3GPP; 30%), which is driving the mobile network specifications. 3GPP did achieve the highest scoring in the "important" category by a considerable margin (58%), confirming it is also a major player in FMC standards development.

In third place was the Telecom Infrastructure Project (TIP; 24%), which is relevant due to its focus on specifications that will enable FMC to run on cloud-native platforms. As documented, this goal has considerable support.

Figure 15: Ranking FMC specifications/standards
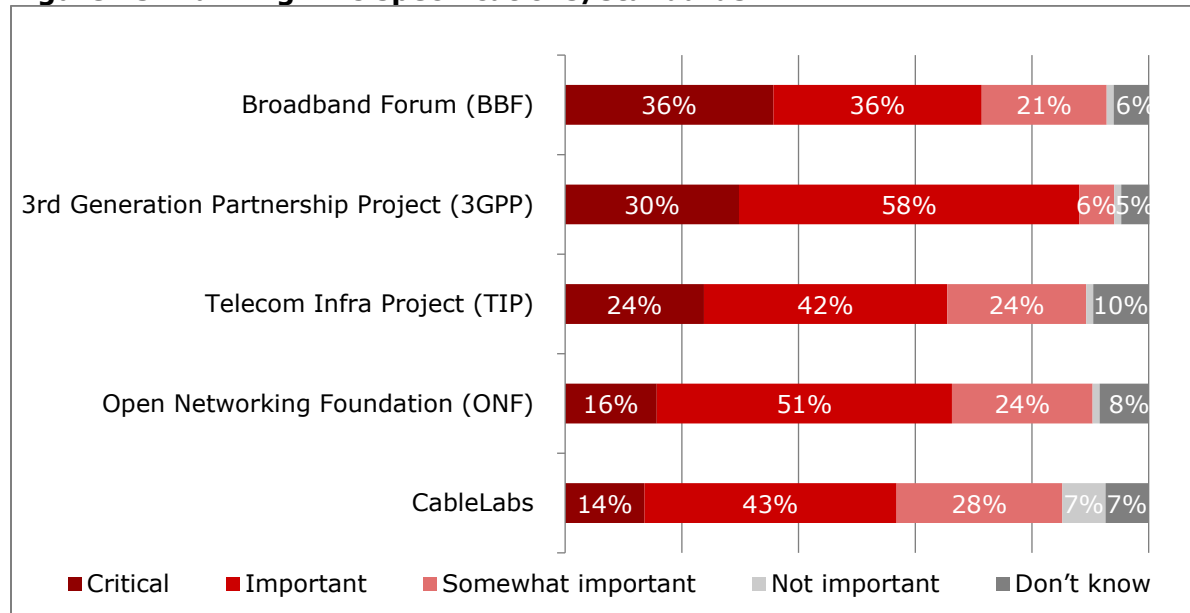
Question: How important are the FMC specifications/standards from the following bodies? (n=81–84)
Source: Heavy Reading

The final topic addressed in the survey was regulatory-related. Since fixed and mobile legacy networks have been run for many years as distinct networks, regulatory bodies have also tended to operate as separate entities.

The question the survey wanted to address is whether this separation of fixed and mobile networks would create regulatory issues that could ultimately encumber the adoption of FMC. The survey respondents were provided with three choices. The first option, which 23% selected, was simply "No."

The remaining "Yes" responses capture that there are some regulatory-related concerns here. While 37% voted "Yes" without restriction, indicating concerns exist, the largest of the three groups (41%) selected the "Yes, but we expect these barriers to subside." This indicates they are seeing the progress that should ultimately make the regulatory impact less of a factor.

The aggregation of "No" and "Yes, but we expect these barriers to subside" inputs represent 64% of the entire survey inputs. Overall, this indicates that the regulatory impact should not have a lasting negative effect on FMC adoption.

CONCLUSION

The survey data presented in this white paper provides valuable insights into when SPs will implement FMC, the market drivers, valued use cases, and implementation challenges.

As discussed, SPs are following an aggressive implementation schedule, with 48% currently deploying some form of FMC and 41% planning to deploy FMC in the next 12–18 months. The remainder (12%) plan to deploy in 19–24 months.

These deployments are driven by both operational and service considerations. For example, operational savings achieved the highest ranking, with enhanced subscriber experience and capex optimization/savings also figuring prominently.

From a services perspective, SPs are focusing on the delivery of harmonized fixed and mobile enterprise services, including services such as UC, since they view those services as representing the greatest potential for revenue growth.

To support these harmonized services, the SPs recognize they must implement foundational network capabilities, such as a common security policy enforcement model and a single authentication model. Ironically, while SPs plan to leverage FMC to deliver a single security model, security-related challenges were assessed as the greatest challenge in rolling out FMC. This confirms additional work is necessary in the security space.

The survey data also confirms that FMC is also relevant in the cloud. About four out of ten of the SPs already plan to run FMC services on a cloud-native platform, with nine out of ten of these SPs committed to utilizing CaaS from hyperscale partners.

In conclusion, Heavy Reading believes the best way to describe the state of FMC is that despite the challenges, FMC is already on a solid business and technical footing, with its best days yet to come.