vendors and independent developers, with the Linux Foundation playing a key role. Partners for Magma in the vendor world include Airspan, Amdocs, Baicells, Mirantis, and NTT Data/Everis.

The business models for Facebook Connectivity's innovations lean towards openness. For Terragraph and subsea innovations, the products are licensed for free to partners, who manage manufacturing, installation and customer support. For Magma, it's an open source product, so follows the same essential model. For Bombyx, the business model is not yet determined. It will likely need a large utility partner, or government entity, plus a manufacturing partner with relationships in the utility sector, to get off the ground. Facebook has no interest in becoming a vendor, so careful management of partnerships is key.

## Subsea cable projects lowering cost of connecting markets

In addition to new tech, Facebook is investing heavily in subsea cable infrastructure, with one focus targeting regions with limited or costly international cable infrastructure. The company is not alone in this respect. Microsoft and Google also invest in multiple subsea cables and develop some of their own technology for the cable infrastructure. Many of the subsea projects involving webscalers have co-investment models, long commonplace in the subsea world. The MAREA transatlantic cable, for instance, went live in 2017 and is co-owned by Microsoft and Facebook, with Telxius as a third partner in charge of operations. Another transatlantic cable, Dunant, went live in 2021 and is owned exclusively by Google. In August 2021, Google and Facebook jointly announced a pan-Asian cable system, Apricot, to be completed by 2024. Facebook, Google, and telco XL Axiata are also working on a transpacific project called Echo, to be completed by 2023. Facebook is also pushing a separate transpacific project, <u>BiFrost</u>, with coinvestors Keppel T&T (Singapore) and Telkom Indonesia's Telin unit; RFS date is set for 2024. Around Africa, where Internet connectivity is most limited and Facebook's penetration relatively low, there is also an important project underway: 2Africa (Figure 11).



## Figure 11: Facebook-driven 2Africa cable system map

Source: 2Africa

This system rings the entire continent of Africa, through the Mediterranean Sea. The 37,000km project will complete in 2023 or 2024. It's significant that Facebook is the only big webscaler behind this one; other partners are telcos (China Mobile, MTN Group, Orange, stc, Telecom Egypt, and Vodafone), and a regional data center operator (WIOCC).