



# FSM Wholesale Connectivity

INTRODUCTION FOR POTENTIAL SERVICE PROVIDERS

NOVEMBER 2020

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## 1. Overview

The purpose of this document is to provide a high-level overview of the new Fiber to the Home Network that OAE is going to rollout on behalf of the FSM National Government. A key goal of the National ICT and Telecommunications Policy is to ensure that as many homes, businesses and offices of the FSM have access to world class connectivity at an affordable and equitable price.

The information is a high-level view of OAE's assumptions at the time of writing and are subject to change and improvement. They are for information purposes only. The actual service descriptions, contracts and operations manuals will have further detail when they are developed.

Throughout this document the term Open Access Entity (OAE) is used to refer to the FSM Government owned organization that owns and operates the wholesale network. The OAE's legal name is FSM Telecommunications Cable Corporation (FSMTCC) and as this is similar to the legal name of Telecom (FSMTC) to avoid any confusion OAE is used to mean the wholesale only business building the new FTTH network and Telecom is used to refer to the retail telecommunications company Telecom.

The initial scope of the program to the main islands of Yap, Pohnpei and Kosrae. The inner lagoon of Chuuk state is in the wider scope but is slightly more complicated due to FTTH already being deployed in Weno and the need to coordinate FTTH build in the other islands of the lagoon with power infrastructure upgrades. Once the high-level strategy and plan is confirmed for Chuuk, the build is expected to follow the same process as for the other states.

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## 2. Introduction to the FSM Telecommunications Industry and Regulatory Environment

### 2.1. Introduction

OAE is a participant in FSM telecommunications industry. Broadly, the telecommunications industry can be defined as fixed and mobile calling, messaging, data and internet service. These products are delivered across a variety of platforms.

The diagram over the page illustrates the high-level structure of FSM's fixed access and mobile networks infrastructure, and how telecommunications networks typically transfer information from a local premise (e.g. an internet browser or email in a home) via exchanges and potentially international undersea cables to its intended destination. The telecommunications network shown below broadly includes the network

infrastructure and equipment to deliver communications services both within FSM and to the outside world, allowing fixed and mobile phones and data devices such as computers to communicate with other devices.

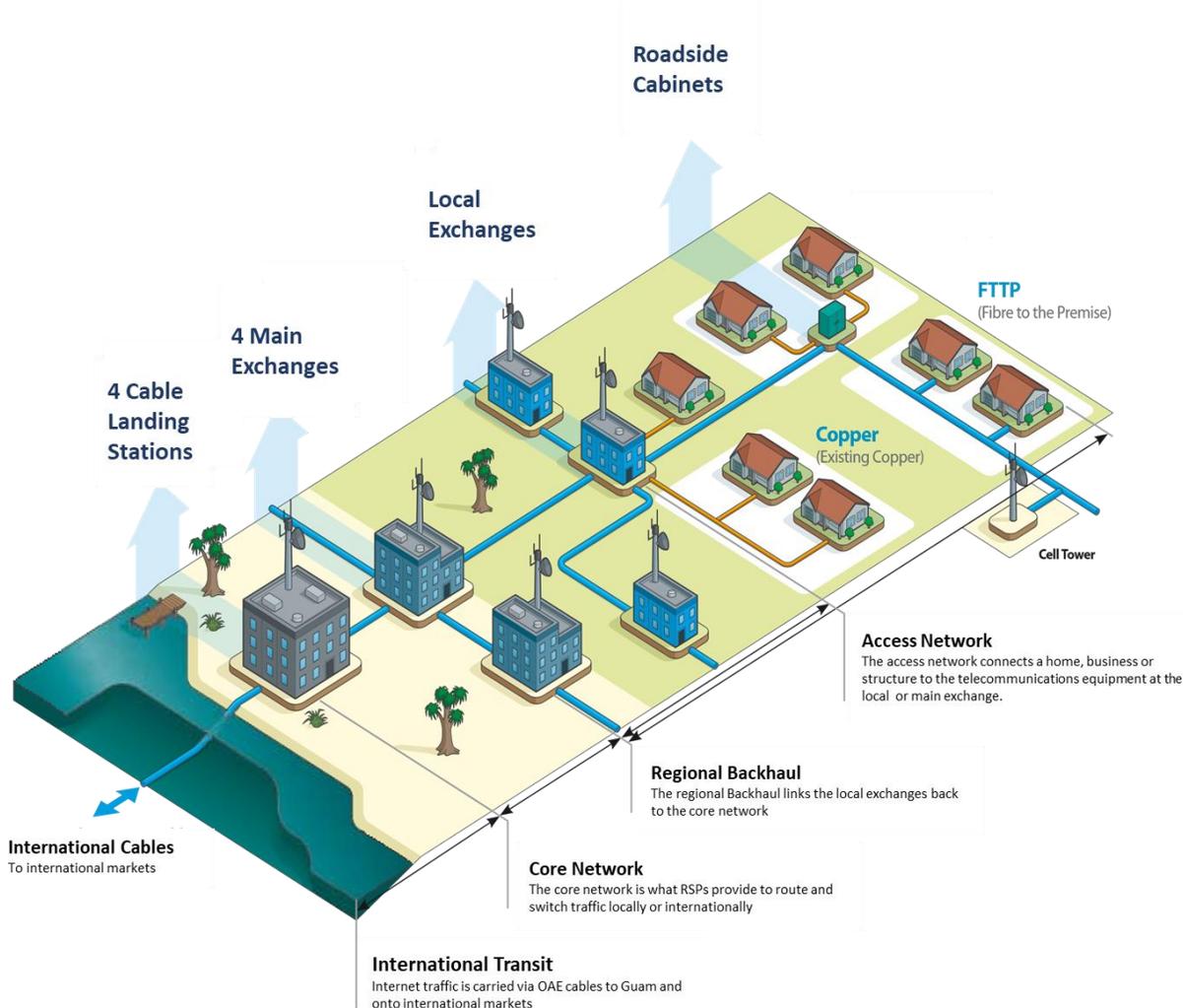


Figure 1 - Different components of the FSM telecommunications networks

#### FSM Network Overview

The original FSM telecommunications network was based on copper cables that carried the voice and data traffic and, whilst fiber has been added in limited means as a backhaul technology, use of copper is still predominant. It is what is used to provide nearly all fixed telephony and internet services throughout FSM.

In more recent times, telecommunication networks have begun to transition towards the use of fiber optic cables (fiber) throughout the core network, regional backhaul and the access network. This technology allows data and information to be sent down a very thin strand of glass via light waves rather than electrical signals. Light transmission allows for higher data rates than conventional copper wire, coaxial cable and many forms of radio transmission and as a result more information can be transferred quicker from one point in the network to another when compared to the older network technologies.

The diagram above illustrates in more detail the range of connection options from a home, business or other location to the first traffic aggregation point in the network (often an exchange or cabinet). Underlying access technologies that enable access to the network include copper, fiber and other cable networks as well as mobile and fixed wireless services.

#### Existing network architecture

Across the fixed local access network there are three main methods of connection of a premise to the local exchange (1) Directly connected to the exchange through copper (2) Connecting to a cabinet by copper and then from the cabinet to the exchange on fiber or, in the future, (3) Directly connected via fiber. Within FSM the objective of the Government's Digital FSM Initiative is to deploy a fiber to the premise (FTTP or FTTH) local access network infrastructure throughout the main islands of each state.

The copper access network (often referred to as the local loop) is currently the most common form of local fixed access network connection in FSM and utilises copper for the connection between a premise and a roadside cabinet or local exchange.

The Government's Digital FSM Initiative will see the construction of a fiber to the premise (FTTP) network. This network will utilise fiber cables from the exchange to roadside cabinets as well as over the final connection between the roadside cabinets and the end user premise. Typically the FTTP local access network architecture allows for the highest data speeds and capacity which enable high bandwidth end user services such as Internet Protocol Television (IPTV) (whereby television is delivered via the internet or another access network) and high definition video conferencing, which are less effectively delivered over existing copper access networks.

## 2.2. Key telecommunications definitions

#### The Open Systems interconnection model

The Open Systems Interconnection model (OSI model) can be used as a further way of describing a telecommunications system and is based on layers which subdivide the system from the physical assets in the ground right through to the application on a computer being used by an end user. The model is composed of seven individual layers and each layer builds on the next to enable the transfer of data and information between two or more points in a network.

Within the telecommunications industry the concept of OSI model layers are used as a basis on which services and products are described. They are used as useful "breaks" to describe the differences between the technologies and services that wholesale service providers like OAE deliver to retail service providers.

#### Layer 1

Layer 1 within the OSI model is classified as the physical layer and within a telecommunications fixed access network this can be considered to comprise copper and fiber cables and co-location space inside exchanges or cabinets. At the physical layer, data is transmitted using electric voltages through copper and pulses of infrared or ordinary light through optic fiber. In the situation where a retail service provider purchases access to physical assets, for example dark fiber access, this is referred to as a Layer 1 product within the OSI model.

It is a Layer 1 product that will be the basic service that OAE intends to provide to service providers. OAE does not intend to provide any electronic systems for local access.

## Layer 2

Layer 2 within the OSI model is classified as the data link layer and provides the functional and procedural means to transfer data between network entities. Within the telecommunications fixed access network this can be considered to comprise of the equipment and services which transmits basic data from one point in the network to another over the Layer 1 physical assets.

OAE today provides layer 2 services to link between FSM states and the international connectivity to Guam. In long range submarine cables, it is neither practical nor efficient to provide long-haul dark fiber to individual service providers.

### Fiber to the Home

Fiber to the Home (FTTH) is a now a mature technology that has achieved scale deployment over the last ten years. FTTH uses fiber all the way from the telephone exchange to the end user's home. It allows for practically unlimited bandwidth and has a lower cost to deploy and maintain than copper networks.

The key innovation in modern FTTH networks is that they take advantage of the long distances that fiber systems can work over without requiring and amplification or additional electronics. In a typical local access network designed for mass market, customers can be up to 20km away from the where the main telephone exchange is located and still get the exact same service as the person who lives right next door to the exchange. This is fiber's key advantage over copper or radio technologies – the distance it drives and the near unlimited bandwidth.

OAE will provide the fiber that links from each individual premise back to the telephone exchange. It will provide a jack point (Internal Termination Point ITP – in diagram below) in the home and co-location space (room to place equipment) in its exchanges. The service provider uses the fiber to connect its modem or WIFI router that it provides to the end user to its equipment in the exchange. OAE maintains and looks after the fiber between the home and the exchange.

OAE will also then provide the inter-state and international capacity to connect from the telephone exchange to the rest of FSM and the world.

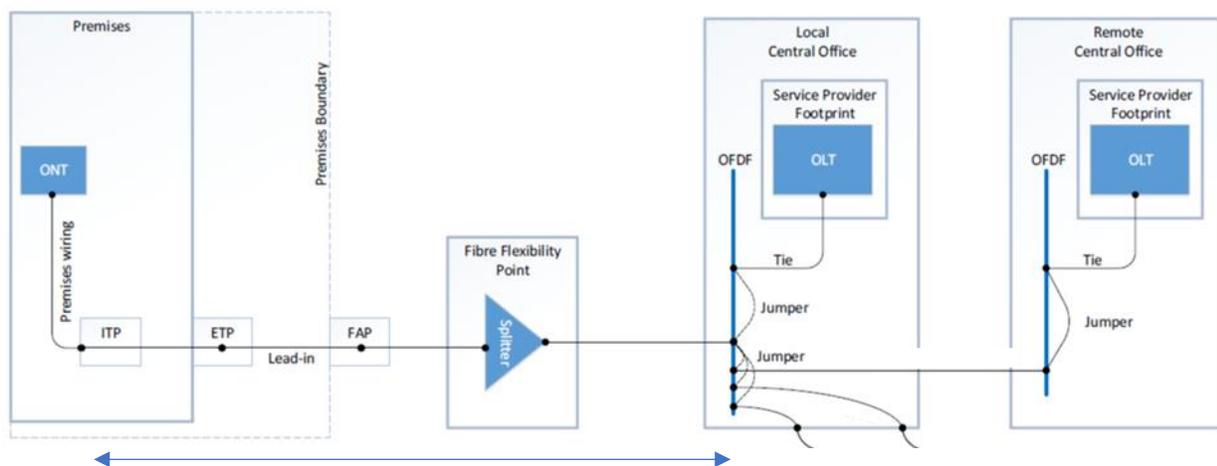


Figure 2- OAE's access business. Items between the arrows are the likely scope of OAE's business. Retail service providers will provide equipment in the home (Optical Network Terminal - ONT) and at the telephone exchange (central office) – (Optical Line Terminal -OLT)

## Open Access Fiber Network

An Open Access Layer 1 Network is designed to allow for multiple providers electronic equipment to be used. Each operator or service provider gets equal access to the same underlying network no matter how large or small they are.

The network must be designed to easily allow the following services:

- Colocation space, power and cooling at the Central Office;
- Dark fiber backhaul from the splitter location to the CO;
- Splitter colocation space;
- Built so that multiple service providers can achieve a minimum viable scale; and
- Dark fiber between splitter location and home.

An open access network is built less efficiently than it would be for just one operator. The trade-offs that network regulators and policy makers make in most markets (including FSM) is that the small increase in cost is made up for from the consumer benefits from lower prices, innovation and high-quality services provided to end users.

When comparing an open access Layer 1 network to one built for only one operator; the main differences are typically that the first splitter is located much closer to the customer (typically in the pole or pit) with no space for additional splitters and minimal spare fibers back to the central office. The costs for the single operator are marginally lower, but the design prevents any other person from being able to use the network. In this environment a competitor could only use the technology and pricing that is set by the network builder.

The key point is that the deliberate choices made in how the network is designed and built makes it better or worse for allowing others to access fiber services.

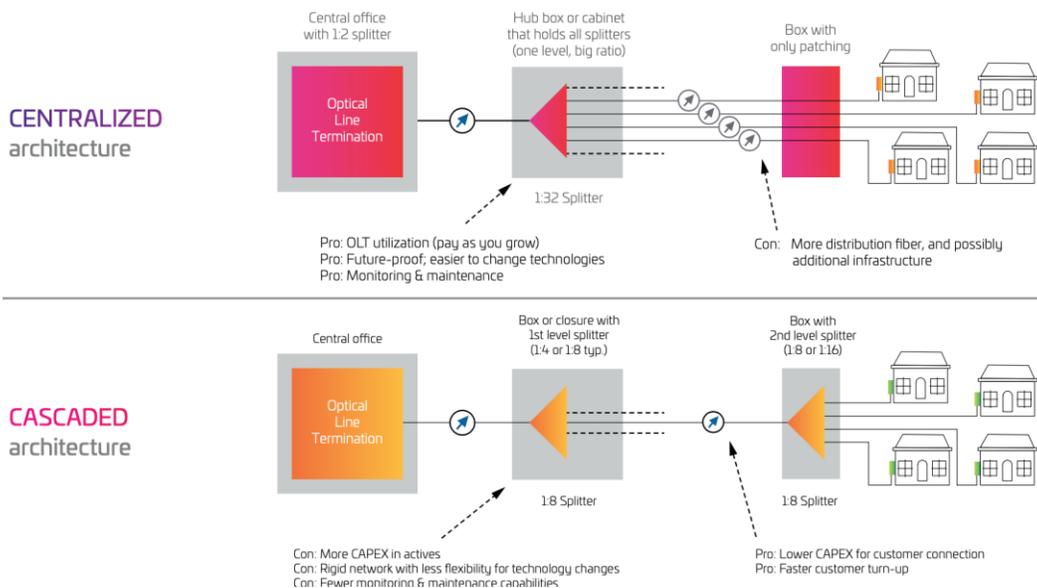


Figure 3 - Comparison of open access (at the top) network design to vertically integrated (at the bottom) network design. The difference between the two is about how economically feasible it is to have more than one operator.

### 2.3. FSM Regulatory Environment

After completing a comprehensive ICT Policy review in 2011, the regulatory environment in FSM has changed considerably. Previously all telecommunications services were delivered exclusively by FSM Telecom Corporation, a Government owned corporation.

The FSM Telecom Act 2014 Amendment introduced significant changes

- Opened FSM for multiple Telecommunications license holders
- Allowed for establishment of the Telecommunications Regulation Authority
- Allowed for establishment of the Open Access Entity: FSMT Cable Corporation

The Telecommunications Regulation Authority (TRA) was formally established late 2018. The TRA has internationally recognized expertise and published its rules in October 2019.

The TRA prefers commercial resolution as the primary means of resolving industry disputes. The orientation is for licensees to propose new services and investments to the industry and that the TRA only gets involved where there is a dispute. It does not approve or set services, that is for the industry to agree between itself. However, it has all the necessary powers to resolve any issue and is guided by the principles in the 2014 Act.

## 3. Business Overview

OAE will become FSM's largest telecommunications utility business and will be the nationwide owner and operator of the new fixed line access network infrastructure as well as its existing international cable links. Assets will comprise of local exchanges<sup>1</sup> in each State and will grow to approximately 7,000<sup>2</sup> lines connecting FSM homes and businesses. A range of telecommunications providers will use OAE's network to deliver phone and internet services to FSM citizens and rely on OAE's fiber network capability and expertise to build and maintain their communications services. The deployment of fiber is central to the Government's Digital FSM Initiative in respect of which OAE has a leading role.

OAE will:

- Continue to provide international and interstate submarine cable transport, expanding to all states in FSM with the completion of the Kosrae cable systems.
- Be a national provider of Layer 1 wholesale local access fiber services to retail service providers.
- Provide a comprehensive range of backhaul and co-location services to retail service providers.
- Sell open access, non-discriminatory and equivalence of inputs services (i.e. with exactly the same price and technical specification) to its customers.
- Manage its fiber network through provision of build, installation and maintenance services.

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<sup>1</sup> OAE will operate facilities that will be like a telephone exchange. It will be the physical location where fiber is terminated and OAE will offer space for service providers to connect their equipment to OAE fiber. Telecom will continue to own its existing copper-based telephone exchange buildings.

<sup>2</sup> Excluding Chuuk Lagoon. Exact number addressed by OAE will depend on how Chuuk is addressed which is not yet finalized.

- Connect end-users (consumers, businesses and Government offices) and install certain equipment in their premises.

As the network grows and reaches capacity, the fiber local access business should grow to approximately \$1.5m per annum within five years, connecting over 7,000 homes, businesses and government offices.

OAE's total business will grow to approximately \$3m, providing local access, inter-state and international connectivity to all of FSM.

#### 4. OAE's Business Strategy

OAE's strategy is to drive uptake and usage of connectivity as a key component of the Government's Digital FSM policy. OAE will do this by becoming FSM's nationwide provider of telecommunications infrastructure, serving all customers on an open access basis through a fiber network and delivering innovative services to FSM customers.

In the near term, the strategic priority for OAE will be to transition to a new business model while building the new fiber network, creating momentum as the country transitions to a fiber-centric communications infrastructure.

#### 5. OAE's customers

The OAE customer base will grow over the next five years from a single customer to multiple retail service providers. They will buy Layer 1 local access and Layer 2 international transport services on an equivalence basis.

Under the 2014 regulation in the Telecommunications Amendment Act, OAE is prohibited from providing services to retail end-users such as consumers, SMEs and corporates. The TRA will maintain a register of license holders (non end-users) to whom OAE can supply services. The TRA will assess the eligibility of new non end-users and only once a company is on the register will OAE be able to supply products and services to that company.

OAE's success will depend on having a thriving set of retail service providers who will compete to offer internet and other services over the OAE network. The development of multiple retailers will encourage innovation and service uptake.

OAE has been talking to numerous local and international providers about the potential of FSM as a market. Whilst the small market size and remote location make it challenging, there is interest.

OAE is also confident that locally based providers will be able to start and enter the market. They will be able to bring a fresh and locally FSM based approach to selling and supporting telecommunications. It is likely that the evolution of Retail Service Providers as they develop their businesses will impact and improve product, pricing and network plans. The underlying premise of OAE is that it is able to adapt to its customers changing needs.

## 6. OAE networks

### 6.1. The existing international network

The OAE has either owns outright or has interests in the following cable systems and assets.

- Yap spur to SEA-US cable and IRU with Telin to Guam
- Chuuk - Pohnpei Cable system
- IRU in Pohnpei - Guam (Pohnpei spur to Hantru-1 to Guam)
- Cable Landing Station Inventory in Yap and Chuuk

In addition, OAE is a part owner in the proposed East Micronesia Cable System expected during 2021, co-owned by FSM, Nauru and Kiribati. All networks are modern and are either 100Gbps wavelength based or are in the process of being upgraded. Customer interfaces will be 10Gbps.

### 6.2. The new fiber network

In May 2020, following the conclusion of detailed discussions between the National FSM Government and the World Bank, The Digital FSM Project was deemed effective by Congress and OAE has been established as the implementing agency for the national connectivity component.

This program of work will see OAE deploy fiber to homes, businesses, schools, hospitals and health service providers within the main islands of each state. The World Bank investment in connectivity is approximately \$15m, including an allowance for services to the outer islands.

The deployment of the fiber network is a significant undertaking. OAE estimates that to build the network OAE will require the deployment of approximately 760 kilometers of new fiber lines alongside roads, either underground or on existing power infrastructure to build the communal network. It will also require additional deployment of fiber from the communal network to connect a premise.

The Network deployment will require the support of multiple parties and suppliers in respect of the significant civil works required to deliver against the deployment plans. OAE expects that this will require approximately 30 additional technicians, employed by OAE's third party suppliers, to achieve the plans. These additional roles are expected to be met by local FSM people.

OAE commenced the high-level architecture and design in November 2019 using Project Preparatory Advance funding from the World Bank. Further detail on the architecture and approach is available in the [FSM FTTH High Level Architecture and Assumptions](#) paper dated March 2020.

The fiber build is expected to continue through to 2025. The new fiber build will comprise two components:

1. Communal infrastructure which will deliver fiber past premises; and
2. the connection of individual premises to the communal infrastructure as dictated by demand, including installing equipment in the end-user's premises and in the exchange to enable service delivery.

Contracts for these two elements are to be procured separately.

The build of the communal infrastructure is to establish the initial network along roads and is expected to be completed through 2021 and early 2022. The connection of individual premises will start once the first communal network is built in each state and will continue on for a longer period of time. OAE expects that the bulk of the network migration will occur during 2022 and will largely be complete by 2024.

While the contracts are to be let separately, there is no reason why one provider could not bid for building the communal network and then connecting the individual homes and offices.

OAE does note that the skills for building the communal network and connecting customers are different. The former is more akin to civil utility build like water or roading, whereas the latter is a more customer service oriented as requires technicians to go into each and every home to connect them to the new network.

## High level plan

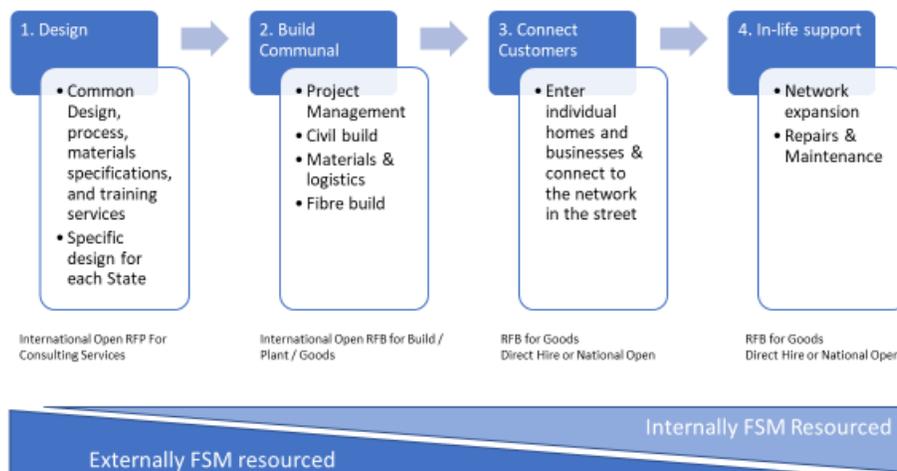


Figure 4 - Stages of transition of the new Fiber network from build to operate. Stage 1 – the Design Phase has already started. This document focuses on 2 and 3. OAE expects that the organization who undertakes stage 3 would also be a likely candidate for stage 4.

### 6.3. Building the communal network

The communal infrastructure deployed by OAE must at a minimum pass all premises in the main island of each state that currently receives copper telephony and ideally to all premises.

The plan is to start in Yap and then move onto Pohnpei and Kosrae. The plans are still in the process of being developed and expect to be confirmed later through 2020.

Details for Chuuk and the islands of the inner lagoon will be completed once the plans for the three other states are under way. This is expected later in 2020. Chuuk is more complicated owing to the existence of fiber to the home in Weno and the technical design complications around reaching the islands of the lagoon.

Deployment of the communal infrastructure will be achieved utilizing several deployment methods. Wherever economically viable, the network will be deployed underground using low impact micro trenching technology. However, until the deployment of the network is fully underway the exact deployment method mix will not be known and could change significantly and will vary throughout the deployment.

The communal network also includes the establishment of a fiber central office or exchange. This is where the fibers are terminated and handed over to retail service providers and it is usually located in a geographically central location so to minimize network construction costs. OAE can either establish new locations, expand within the existing footprint it has for international cable landing stations, or find an agreement with a third party to provide space.

OAE will provide a detailed design that it will then ask contractors to build. OAE's goal is to be able to broaden the range of potential contractors outside the traditional telecommunication field. The contracts may be to install new underground conduit with breakout pits and boundary connections to each premises; or it could be affixing cable to utility poles and installing termination boxes ready for individual customer connection. OAE expects these tasks to be within the skill set of a much wider range of organizations. It is looking for civil contractors to place the materials either underground (reinstating the surface to agreed standards) or on existing utility poles.

OAE will provide the materials, detailed instructions, necessary permissions and agreements with National, State and Municipal Agencies and fiber specific training.

Depending on the capabilities of respondents, some tasks like property access permissions, and state and municipal agency agreement for build may be contracted to the network builder rather than OAE.

#### 6.4. Connecting customers – connection of fiber to premises

OAE will connect customer premises and install equipment in customers' homes to enable service delivery to retail service providers. Ultimately, the connection of premises will be driven by end-user demand for fiber-based products and services. End customers will need to order a service through their service provider and the service provider will need to then order a service from OAE.

Connection requests are expected to come from either new service providers winning customers from Telecom or from Telecom choosing to migrate customers from its existing network to the new fiber network.

The connection will include fiber from the communal network to an optical jack point inside the customer's premises. The customer will connect an optical network terminal (also called a Residential Gateway / WIFI Router / Modem) that is provided to them by their RSP into the jack point. OAE does not plan to charge an install fee.

The connection from the communal infrastructure in the street will either be underground or aerial depending on what infrastructure is deployed in the street. The objective is ensuring the optimum mix of cost, reliability and aesthetics.

OAE is looking to engage a contractor in each state (or a single national provider if appropriate) to connect homes to the communal network. Ideally OAE is looking for a standard price for each standard<sup>3</sup> connection.

Based on the business modelling and forecasting that OAE has completed, it expects demand to be slow initially as service providers and customers gain confidence in the new network and its processes and then to increase before slowing. Managing the transition through the different demand phases will be one of the challenges for whomever OAE contracts with to deliver the service.

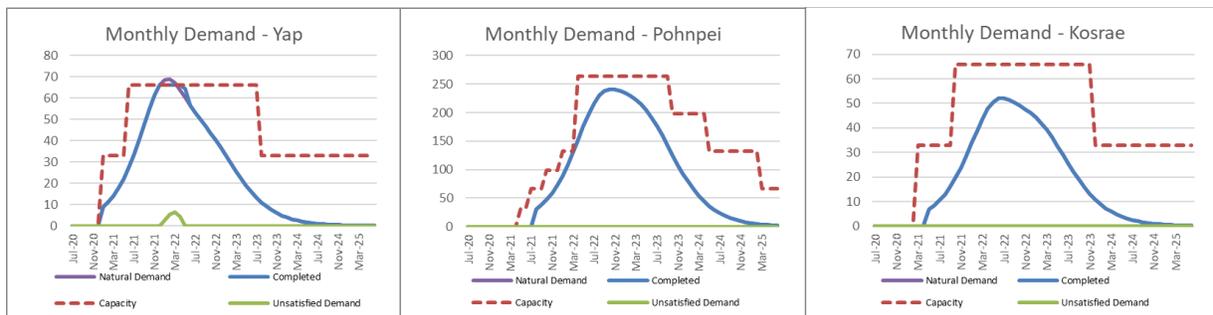


Figure 5 - Projected take-up rate, and expected number amount of installation capacity required in each state. It is expected that a crew of two people will be able to complete 2 installs per day. Adjusting for working days and the fact that they won't be able to run at full efficiency for practical reasons means that each crew is expected to complete 33 installs per month. Using that yardstick, Yap and Kosrae will need a peak of two crews, Pohnpei is expected to need a peak of eight.

OAE has chosen a medium uptake scenario. This assumes that new entrants enter and move customers relatively quickly to fiber based on the superior performance for the same price as existing copper services.

## 7. New fiber services

The new OAE products and services will broadly consist of a range of Layer 1 (physical) products that provide dark fiber access between the handover point at the exchange and the customer's premises. Additional services will include co-location, backhaul and other ancillary services needed to support service providers.

All OAE products and services will be supplied to all retail service providers on an open access and non-discriminatory basis.

The OAE products and services can be grouped into five product portfolios:

1. Longhaul Submarine Transport Products – linking FSM States to each other and Guam
2. Fiber Access Products – customer premise to exchange.
3. Backhaul Products – exchange to customer handover point.
4. Co-location Products – rental of space in an exchange

<sup>3</sup> Most connections will be straightforward connecting a single dwelling home to the communal network in the street. OAE expects there to be a number of more complex installations (for example to multi-dwelling units or remote villages) that will require a time and materials-based approach.

5. Field Services Products – activity based services supporting the provisioning, maintenance and build of the above products.

### 7.1. Longhaul submarine transport products

These are the existing inter-state and international submarine transport links that OAE has offered since the build of the Yap and Chuuk cables. Connectivity will be expanded to Kosrae once the cable is completed. None of these longhaul services are protected meaning that a cable fault could isolate the states from each other and the rest of the world. Interfaces will be offered in 10Gbps increments.

The submarine cable business will charge based on the market share by revenue of each service provider. OAE and FSM is fortunate in having had the World Bank grant fund the submarine cable build and having installed significant capacity. OAE does not want its pricing structure to restrict access to bandwidth and wants to encourage service providers to provide as much bandwidth as their customers demand. Therefore pricing is based on sharing the ongoing costs based on revenue basis as opposed to charging for bandwidth in the traditional manner.

This approach to pricing provides fair entry to new entrants and a gradual reduction in costs to the incumbent(s).

More details are in the interstate and international pricing document. OAE expects to have sufficient installed capacity to be able to accommodate 40% annual growth in traffic into 2030 and beyond.

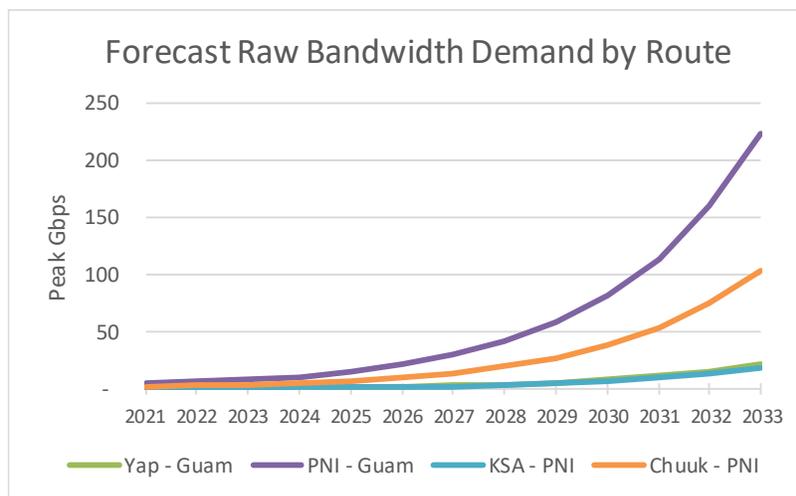


Figure 6 - OAE Raw International Bandwidth Forecast - well within the installed capacity of OAE

### 7.2. Fiber access products

OAE will offer a broad range of Layer 1 fiber access products that will be delivered over the new OAE fiber network.

The introduction of the new fiber network will see the development and deployment of a new generation of fiber-based access services that will support retail service providers in targeting the residential, business and Government customer base.

The services allow service providers to choose their own electronics and technologies to run over the fiber network. These services are proposed and subject to TRA and industry feedback. Further details are in the FTTH pricing document.

<b>Product</b>		<b>Monthly Wholesale Price</b>
<b>Consumer Shared Fiber 32:1<sup>4</sup></b>	Designed for GPON technologies that support up to 10Gbps today.  Expect to be used to support 1Gbps services to all consumers	\$10
<b>Small Business Shared Fiber 32:1</b>	Designed for GPON technologies that support up to 10Gbps today.  Expect to be used to support 1Gbps services to small businesses.	\$20
<b>Government / Large Business Service – GPON 32:1</b>	Designed for shared GPON Services. Expect to be used to deliver 1Gbps and 10Gbps services over time.	\$50
<b>Government / Large Business Service – P2P 1:1<sup>5</sup></b>	Designed for Point to Point services where the fiber is dedicated between the premise and exchange	\$100
<b>Mobile site backhaul 1:1</b>	Point to Point service from mobile site to exchange	\$200

In addition to the core services described above a range of additional service building blocks are possible. These will allow retail service providers to tailor and further differentiate their offerings in the market. These building blocks are expected to be developed by OAE over time in conjunction with the retail service providers.

There is no initial connection fee to get the network established in a premise for the first time. There will be labor recovery fees for subsequent moves adds and changes, including swapping the connection from one RSP to another at the Fiber Flexibility Point. OAE has yet to estimate these costs.

<sup>4</sup> 1:32 represents the sharing ratio. Each handover fiber will have 32 end premises connected to it. OAE will combine the feeder fiber, splitter and distribution fiber in one product bundle to provide a simpler service. Other options will be possible over time.

<sup>5</sup> 1:1 are direct point to point services.

#### Connection inside the home or office

The service will be terminated on an internal termination point that provides a SCA connection. This provides a simple socket where the service providers ONT (optical network terminal) plugs in. It will need to be located close to mains power to facilitate powering the ONT.



*Figure 7 – Example of an Internal Termination Point. SCA bulkhead connections would be affixed and a Service Provider's ONT would simply plug in to the service.*

### 7.3. Backhaul products

To support retail service providers with the aggregation and transportation of their customer access traffic from the exchange back to their handover point in the network, OAE will offer regional backhaul products across its national fiber network assets.

### 7.4. Co-location products

OAE will provide a range of co-location products that will support retail service providers to deliver telecommunications services to their customers.

Co-location products allow retail service providers to rent space in or on OAE premises (exchanges) enabling retail service providers to house telecommunications and, in some cases, ICT equipment. Locating this equipment in OAE premises allows retail service providers to efficiently and cost effectively connect to the OAE network, or a third party network, by providing retail service providers with not only the physical space their equipment requires but a range of power, security, backup and seismic support options. The Co-location Product portfolio also incorporates the various tie cables and handover connections required to physically connect equipment both internally and externally as the retail service providers require.

### 7.5. Field services products

OAE will grow to having at peak as many as 30 outsourced field service technicians who will be trained to undertake a range of network provisioning, maintenance and build activities for business and residential customers on behalf of retail service providers. There may be opportunities to expand this business to configuring and supporting end customer's network equipment (configuring wifi routers and other home networks).

## Appendix 1 – Premise counts

*Note that these are approximate and should be considered indicative.*

### Key statistics for Yap main island:

2010 Census Count of Homes	1,680	Only residential properties counted
Count of Open Street Maps Buildings	1,927	Higher as includes non-residential, and includes out-buildings, but satellite based analysis means that a number of buildings have not been counted as they were obscured.
Count of Electricity Meter Points	1,874	Starting assumption for desktop based planning. Correlation with request for electricity and broadband is high.
Count of Modelled Buildings from Pacific Geo	1,600	Rough approximation.
Main Roads	47 km	
Secondary Roads	113 km	Note that this includes paths and tracks

### Key statistics for Pohnpei Main Island

2010 Census Count of Homes	5,970	Only residential properties counted
Count of Open Street Maps Buildings	2,716	Missing large portion
Count of Electricity Meter Points	5,159 (2010 census houses with power) To update with actuals from Utility	Recommended starting assumption for desktop based planning. Correlation with request for electricity and broadband is high.
Count of Modelled Buildings	9,465	Rough approximation
Main Roads	80 km	The main ring around the island
Secondary Roads	251 km	Includes the streets of Kolonia and the inland roads and tracks.

**Key statistics for Kosrae**

2010 Census Count of Homes	1,143	Only residential properties counted
Count of Open Street Maps Buildings	641	Missing large portion
Count of Electricity Meter Points	1,079 (2010 census houses with power)  To update with actuals from Utility	Recommended starting assumption for desktop based planning. Correlation with request for electricity and broadband is high.
Count of Modelled Buildings	426	Missing large portion
Main Roads	44 km	
Secondary Roads	34 km	

**Key statistics for Chuuk lagoon [not included within scope of work]**

2010 Census Count of Homes	5,444	Only residential properties counted
Count of Open Street Maps Buildings	8,629	Higher as includes non-residential, and includes out-buildings, but satellite based starting point will miss some
Count of Electricity Meter Points	To be updated	Work assumed to be completed at the same time as electricity build on islands of Inner Lagoon
Count of Modelled Buildings	5,442	Rough approximation
Main Roads	13km	All in Weno
Secondary Roads	96 km	Except for Weno, they are all pedestrian paths and tracks