Türk Telekom
International

**Bridging
Continents**

Company overview

Türk Telekom International, a leading telecommunications operator in Central and Eastern Europe, Turkey, Caucasus, Middle East and Asia. It provides a full range of infrastructure, connectivity, internet and wholesale voice services to incumbents, alternative carriers, mobile operators, cable TV companies, internet service providers, content providers and corporate customers.

Türk Telekom International is 100% owned by Türk Telekom and acts as its international business unit handling all international data and wholesale voice business functions. Türk Telekom International provides single account management and unified network operations over the entire Türk Telekom International network which includes 19 countries in Central and Eastern Europe, Turkey, Middle East and the Caucasus.

Our commitment

Continuing to offer the highest value available through quality network infrastructure, innovative services and a „can do" attitude that delivers the expectations our customers require.

Our mission

Exceeding our customers' expectations by delivering high quality and flexible telecommunication solutions in Europe, Turkey, the Middle East and beyond.

Key offerings

- Seamless connectivity throughout a unique geographical coverage from Western Europe towards Middle East to Asia
- Single Point of Contact
- Fully Managed End-to-End Redundant Network
- Access solutions in various countries using own network or partner's network
- Experience entering new markets throughout Central and Eastern Europe, Turkey, the Middle East, CIS, North Africa and Central Asia
- First mover advantages gained in Hungary, Romania, Bulgaria, Serbia, Ukraine and Turkey
- Understanding of local markets including regulatory and governmental relationships
- Our services had been customized to meet and fulfill the international wholesale market needs

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International

About the Türk Telekom Group

Türk Telekom group is Turkey's world-class, integrated telecommunication and technology services provider offering its customers the complete range of mobile, broadband, data, TV and fixed voice services as well as innovative convergence technologies under the unified "Türk Telekom" brand. Turkey is one of the largest telecom markets in EMEA region with over 78 mn growing population and increasing number of households.

Türk Telekom ownership structure

Effective Free Float
15%

Turkish Treasury
30%

Oger Telecom
55%

Overview of Türk Telekom

- Privatized in 2005 and IPO'ed in 2008; underwent a successful transformation resulting in increased efficiency and enlarged service scope
- Strong management team with a broad international and sector experience
- Türk Telekom Group unified its mobile, broadband, TV and fixed voice brands under single "Türk Telekom" brand. Robust revenue and strong cash flow capacity enabling investment in promising segments and continuous growth.

TTI's role in the Türk Telekom Group

TTI is taking care about the following roles on behalf of Türk Telekom:
- International sales
- International capacity and IP transit supplier management
- International services development
- International wholesale voice
- International market development
- International network expansion
- International roaming and mobile services

Türk Telekom Group Companies

Türk Telekom

Mobile Operator - Retail Broadband Operator

100%	100%	100%	100%	100%
innova	**ARGELA**	*sebit*	**assistt**	**Türk Telekom International**
IT Consulting, Products & Services	IT Product & Software Services	Education Content	Call Center & Customer Services	Wholesale voice, data & capacity provider

Financial and Operational Highlights

Turkey's first integrated company recorded TL 14.5 bn revenue and TL 5.3 bn EBITDA in 2015, at the higher end of the full year guidance.

Turkey's youngest and growing mobile operator with 17.3 mn subscribers as of Q4'15.

Turkey's leading fixed-voice and data provider with 12.9 mn access lines, 8 mn broadband subscribers of which 1.5 mn fiber subscribers as of Q4'15.

Solid dividend policy of maximum payout as defined in the Articles of Association.

Türk Telekom International

Unique Product Features

- Wide geographic reach including Western Europe, Central Eastern Europe and Middle East
- Unique Telecommunication Solutions like: AMEERS and SMW-5
- Continuously developing reach with terrestrial and submarine cable systems
- Direct access to countries across Europe towards the Caucasus and the Middle East
- High flexibility and customized solutions for Wholesale and Business customers

Unique Network Features

- More than 50 major POPs in Europe, ME and Asia
- Over 40,000 km of fiber optic network in CEE, Turkey and multiple connections to the Middle East
- Over 220,000 km of fiber optic network as Türk Telekom Group
- Fast and optimal solution delivery for last mile connectivity
- End-to-end managed, fully redundant DWDM network throughout the region
- Ability to connect difficult-to-reach destinations

Data services and solutions

Managed Wavelength Service

Terrestrial Backbone Network and Sea Cables

- ▬ TTI Fibre optic network
- ▬ Leased Backbone capacity
- ▬ JADI route
- ▬ SMW-3 cable
- ▬ Iraq-Gulf route
- ▬ AMEER Middle East section
- ▬ MedTurk submarine cable system
- ▬ SMW-5 cable

▶ Overview

TTI's Managed Wavelength service provides point-to-point connectivity between end points and is proven as a superior solution to serve high capacity requirements resulting from the Customer's growing data, storage and video traffic demands.
The service is able to carry any data between end points, managed 24x7x365 end-to-end, and may include protection upon Customer's request.

Main features of the service:

TTI's Managed Wavelength service is available over lease or IRU conditions.
The service may be extended over third party fiber network to reach customer's premises.

Advantages

· Cost effective
· Scalable, dedicated bandwidth
· High security and privacy
· Wide geographic reach with terrestrial and submarine (SMW-3, MedTurk) routes
· End-to-end protected, semi-protected, unprotected and diverse (dual link) solution options
· Guaranteed service level agreements
· Strong partnership with other carriers
· 24x7 network monitoring by TTI's Network Operations Centre (NOC)

▶ Features

TTI's Managed Wavelength service is delivered over TTI's reliable and secure fiber network using Dense Wave Division Multiplexing (DWDM) technology to increase bandwidth of existing systems by combining multiple wavelengths or lambdas onto a single fiber. TTI's Managed Wavelength service offers bandwidth options of 2,5G WAN, 10G LAN, 10G WAN, 40G LAN and 100G LAN.
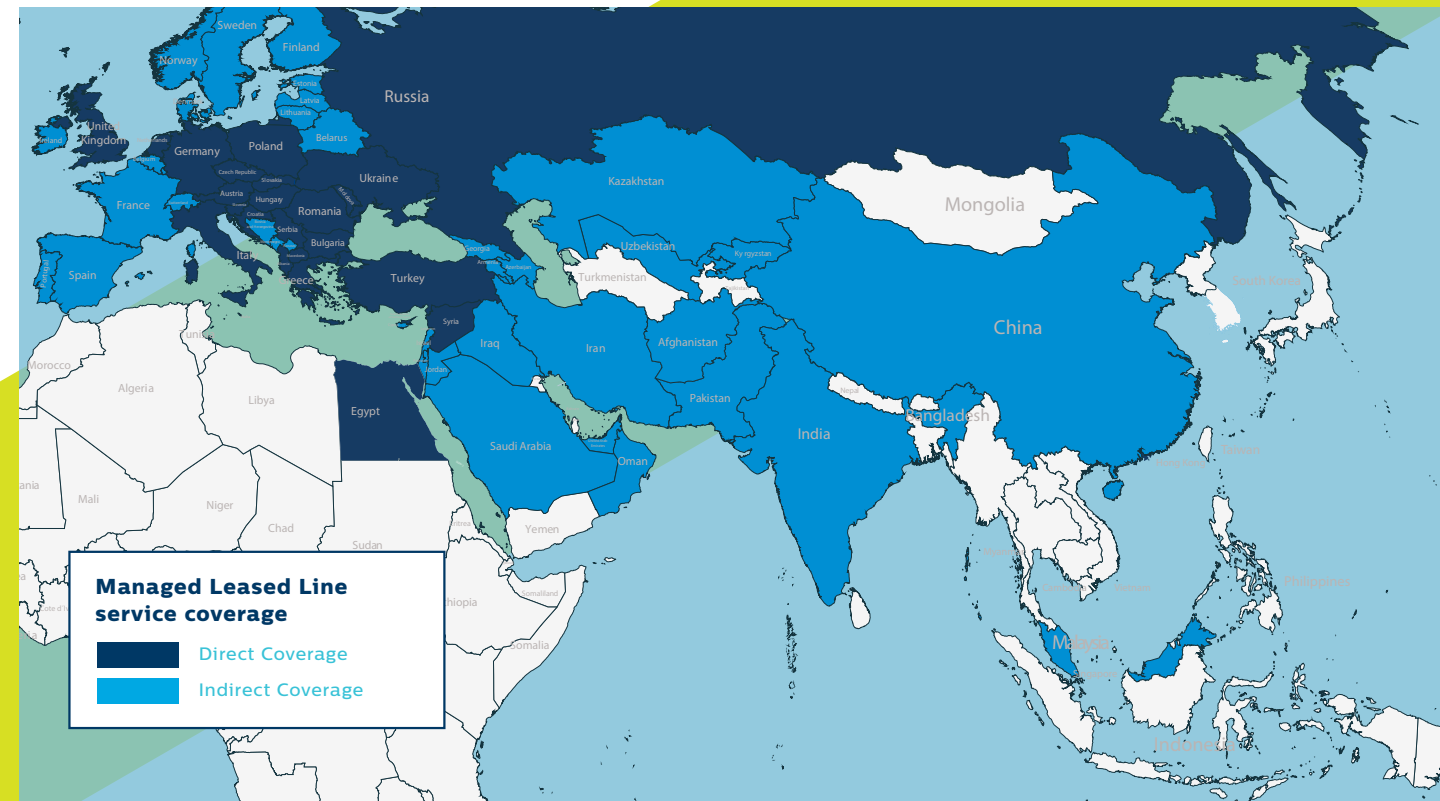
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Managed Leased Line Service

▶ Overview

TTI's Managed Leased Line service offers a private circuit between customer endpoints located anywhere within TTI's and its carrier partners' footprints.

Managed Leased Line is capable of carrying any kind of information ranging from conventional data to voice or video transmission and represents adequate solution for customers engages with continuous data transfer between locations. Service is available for wholesale and corporate customers, demanding a high-quality, secure and reliable solution. Committed bandwidth is guaranteed end-to-end. Service may include protection upon customer request.

The service is suitable for customers require

· Transparent connection
· Highly secure connectivity (point-to-point)
· Guaranteed committed bandwidth

  Available with SDH and Ethernet interface options

· Ethernet over SDH (EoSDH) refers to point-to-point Ethernet services over an SDH backbone where native Ethernet is transported with no need to route at network edges and all Ethernet features are maintained. With EoSDH solution, full transparency and MTU of 9000 bytes over TTI's backbone is granted.

Advantages

· High security and dedicated bandwidth
· Wide geographic reach with terrestrial and submarine (SMW-3, MedTurk) routes
· Flexible bandwidth options from E1 (2Mbps) to STM-64 (10Gbps) (Sub-E1 capacity is available with preliminary feasibility study)
· Protected, unprotected and diverse solution
· Established relationships with local providers
· Strong partnership with other arriers
· Guaranteed service level greements
· Available technical support for 24 hours a day, 7 days a week

▶ Features

TTI's Managed Leased Line service is provided with bandwidth options between 2Mbps and 10Gbps over Synchronous Digital Hierarchy (SDH) or Ethernet interfaces. Bandwidth can be upgraded efficiently when it is needed.

Managed Leased Line service coverage

■ Direct Coverage
■ Indirect Coverage

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Ethernet Service

▶ Overview

TTI's Ethernet service targets communications needs of transparent Ethernet transmission with constant access rate and extremely low jitter. TTI's Ethernet service provides point-to-point, point-to-multipoint and multipoint-to-multipoint connectivity with dedicated capacity on a transmission path between customer locations.

Ethernet bandwidth on 100BaseTx, 100BaseLX, 1000BaseT, 1000BaseLX/ZX and 10GBase-ER/LR interfaces (2-1000 Mbps and nx1Gbps presented on 10Gbps interface) are supported with a range of service options. The Ethernet traffic is transported through the MPLS, native Ethernet network.
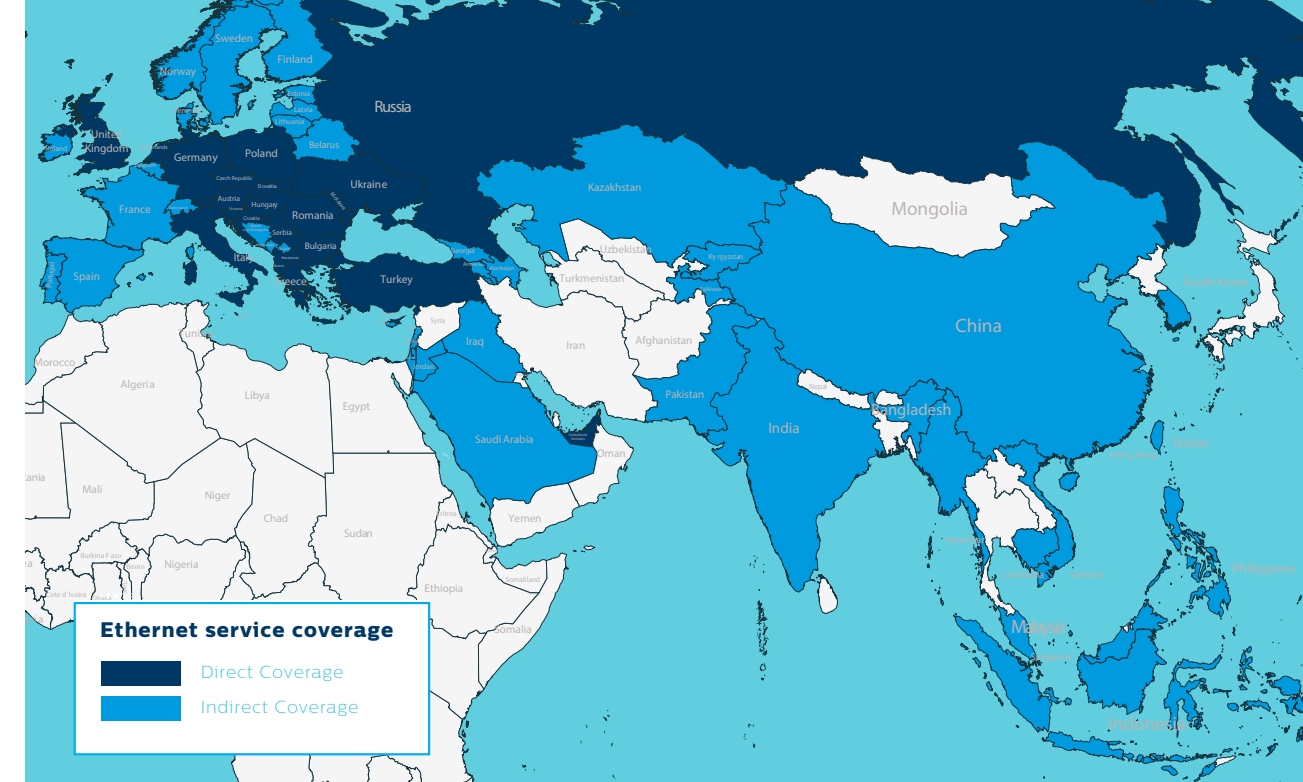
▶ Features

Ethernet solutions are created by use of Access Ports and Ethernet Virtual Connections (EVC's) in a flexible way. All connections with Ethernet interface can transmit Q-tag in accordance with IEEE 802.1Q and are transparent for frames of up to 9000 bytes at our POPs.

Point-to-point, point-to-multipoint and multipoint-to-multipoint topology with Service Multiplexed UNIs is supported. Each EVC is provisioned with committed bandwidth rate; peak information rate can be extended up to local tail maximum capacity.

The Service may include local access tails, provided either by selected local tail providers or over TTI's Metropolitan Area networks, where applicable.

The Ethernet service is point-to-point and fully transparent.

Ethernet service coverage
- Direct Coverage
- Indirect Coverage

Service handover options:

· Each circuit is handed over via standalone physical interfaces at both endpoints.
· Optionally E-NNI interconnection is available with Cisco QinQ.

One-by-one service handover presents all Ethernet private lines on separate interfaces. Aggregated hand-over is also available.

On customer interfaces both tagged and untagged frames are accepted and transmitted unchanged up to the MTU relevant to the circuit.

The transparent Ethernet service is presented on networking devices that are not aware of L2CPs from customer sites. Transmission is free from reordering.

Following protocols can be transmitted transparently:
CDP, LLDP, VTP, STP, UDLD, LACP, PAGP

Ethernet Service

Point-to-Point Service Options (port-based handover)

Gigabit Ethernet interface is available for access speed above 100Mbps only. Ports are set to auto-negotiation by default. TTI Ethernet service is presented preferably via same interfaces on endpoints.

Point-to-Multipoint Service Options (ENNI based handover)

Gigabit Ethernet interface on customer premises is available for access speed above 100Mbps only. Ports are set to auto-negotiation by default. Aggregate interface (E-NNI) is planned as Gigabit Ethernet:

· 1000BaseLX (proposed);
· conforming IEEE 802.1ad (Ethertype is 0x9100)
· 0x88A8 QinQ

Multipoint-to-Multipoint Service Options (ENNI based handover)

Supported services: EP-LAN, EVP-LAN. S-VLAN tag is used to identify a specific VPLS over the ENNI. S-tag can be assigned by TTI or Partner.
· Interfaces: 1000Base-T/SX/LX

Advantages

· Point to point, point to multi-point or multipoint to multipoint
· State of the art Ethernet network throughout the TTI regions
· Low-cost equipment and management system
· Maximum security
· Service can be protected or unprotected
· No contention in the network
· Delivered within robust SLA
· Range of End User Access Lines technologies — fiber, microwave and copper.
· Full proactive support in 24x7
· Unmanaged CPE service

IP VPN Service

▶ Overview

TTI's IP VPN service offers unified, easy-to-use, resilient IP/MPLS (Multi-Protocol Label Switching) based VPN service globally. IP VPN service enables seamless data communication among any customer sites that are connected to TTI's MPLS network via dedicated access lines. All sites are equipped with CPE (routers). Customer VPN and all relevant networking elements are constantly monitored and managed from a central NOC (Network Operation Centre) to ensure reliable high quality operation.

The service includes the following:

· Mix of and prioritization between traffic
  types such as Voice over IP (VoIP),
  Video and Business critical applications
· Multiple accesses to a VPN are configured
  in a fully meshed network topology
· Secure and predictable performance
· Reliability and scalability
· Bandwidth options ranging from
  256kbps to 1 Gbps, with a variety
  of access methods

▶ Features

TTI IP VPN Service is a managed or unmanaged VPN offering. The services enable customers to offer VPN B-ends by utilizing the IP MPLS network infrastructure provided by Türk Telekom International. Two service options are available: Managed CPE and Unmanaged CPE

Managed CPE

TTI IP VPN Service is delivered with a managed CPE (default) with IP connectivity to a VPN. Ordering, provisioning and hardware maintenance is included.

Unmanaged CPE

Option A (wires only) – the CPE is delivered to the End User Site by the Customer. The management and hardware maintenance of the router are the responsibility of the Customer. The demarcation of the TTI IP VPN Service is the customer interface of the NTU.

Option B (Hardware maintenance) – the CPE is delivered and installed on the End user site with a first basic configuration by the TTI Affiliates or sub provider. The CPE type is selected by the TTI Affiliates from the list of the supported CPEs. The demarcation of the TTI IP VPN service is the customer interface of the NTU. The hardware maintenance is the responsibility of TTI Affiliates, so this means in case of CPE failure, the TTI Affiliate will refresh password and then the Customer is responsible for backup and refreshing the configuration. Note: TTI delivers and supports only Cisco CPE.

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IP VPN Service

Local Access Service

An access is delivered to the service demarcation point. The access is connected to an Optical Distribution Frame (ODF) or to the delivered equipment (CPE), if ordered. Different types of access methods and technologies are available. Bandwidth and functionality vary depending on the type of access. The accesses are available on bandwidths between 256kbps to 1Gbps depending on local country infrastructure variances.

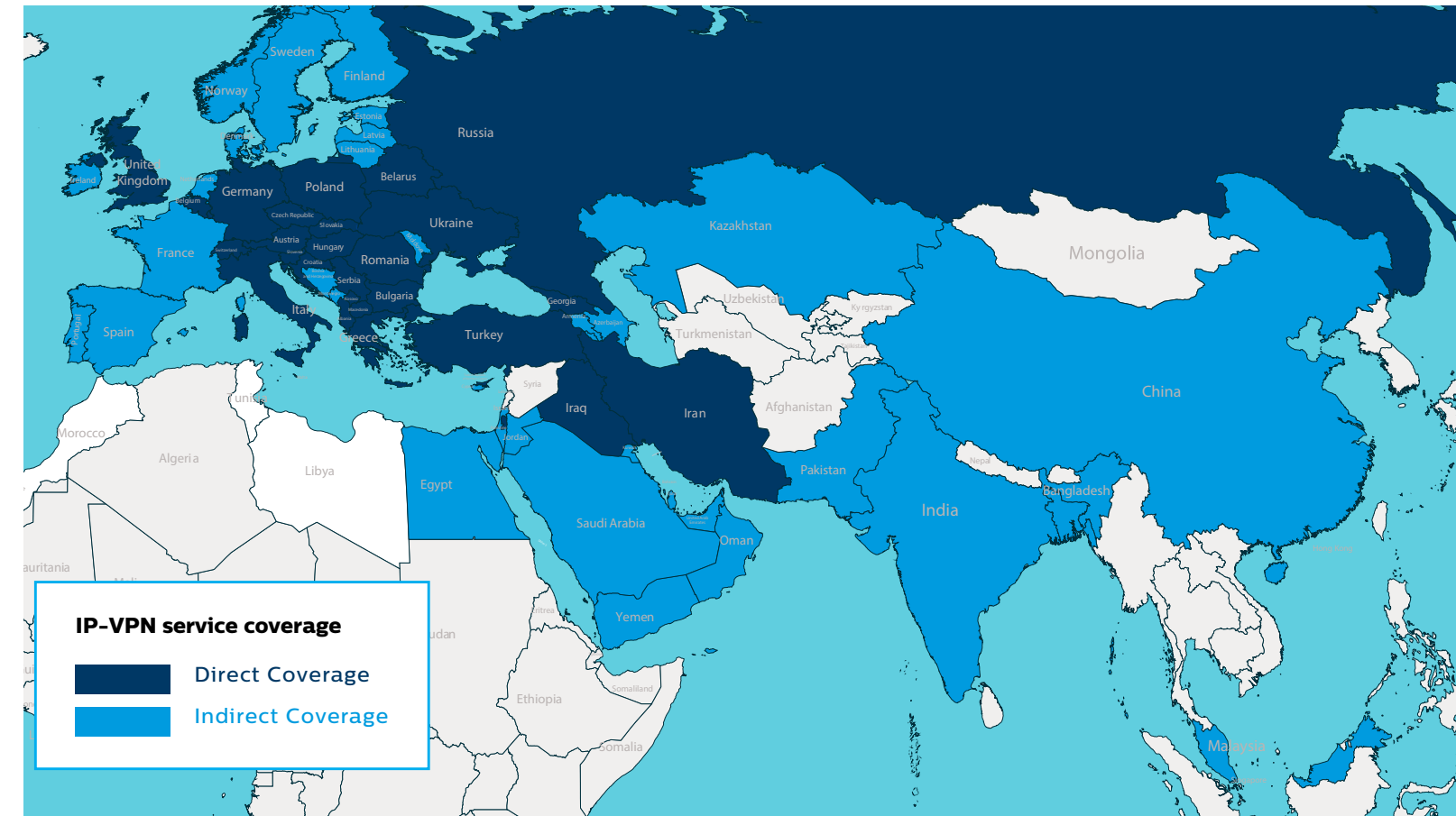Local tail may be established via the following:
· Fiber optic
· Copper
· Microwave on licensed frequency bands

Local tail may be provided as redundant or non-redundant solution depending on the Customer's requirements and technical feasibilities of the requested site.

Add-ons

· Enhanced service availability with a secondary access (back-up or diverse)
· Multiple VPN
· Additional LAN ports

Advantages

· Service enabling any-to-any (full mesh) data communication
· State of the art MPLS network throughout the TTI regions
· Low-cost equipment and management system
· Supports prioritization of customer application traffic with Four classes of service
· Easy network extension
· Service can be protected or unprotected
· Tailored solution for individual business needs
· Wide range of last mile technologies for own back-up solution.
· Guaranteed Service Level Agreement
· 24x7 Network Operations Center

IP-VPN service coverage

Direct Coverage

Indirect Coverage

Internet Services

▶ Overview

TTI offers carrier level quality Internet Services which give Customers Global Internet access over its highly resilient network infrastructure with scalable and affordable bandwidth options.

By having several interconnections with ISPs, content providers, CDNs, and global internet exchanges, TTI offers an excellent internet experience to the Customers.

TTI IP Transit

TTI IP Transit service is the Internet gateway through its extensive global coverage. TTI makes customers become a part of the Global Internet by connecting Customers' network to TTI's Global IP-MPLS network. It offers high quality, scalable and cost-effective bandwidth options, and a low latency to service end-users.

TTI Euro Direct

TTI Euro Direct service provides dedicated access to TTI Core Network, TTI Peers, and TTI Internet Customers. With presence in several European IXPs and private peering interconnections around Europe, TTI Euro Direct offers a real opportunity to enhance European internet connectivity, reduce latency and improve the quality.

Direct Internet Access

TTI Direct Internet Access service gives inestimable local internet connectivity with different local access types in order to serve Customer's lower capacity requirements between 5 Mbps – 100 Mbps.

▶ Features

Extended & Resilient IP-MPLS Core Network Engineered to provide diversity at the physical level, combined with the meshed MPLS network overlay and strict design guidelines possible to provide fully diversified and/or protected end-to-end capacity connectivity

Turkey IP Access

· Providing broadband access to more than 8 million subscribers and 7.5 million mobile internet users in Turkey with a market share close to 80%

IP Subnet & BGP

· A /30 IP subnet for service configuration, supports both IPv4 and IPv6
· Static and dynamic routing configuration and maintenance Interfaces & Connection Speeds
· Available interfaces: Fast Ethernet, Gigabit Ethernet, 10Gigabit Ethernet
· Bandwidth on demand: scalable bandwidth options between 2Mbps and nx10Gbps
· Burstable port support for IP Transit and Euro Direct services

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Internet Services

Support Services

· 7x24 Technical support available
· TTI NOC supervision and on-site support
· Level2 and Level3 escalation support available at technical and commercial side

Pricing Model

· Flat Option: Price model of fixed price and fixed capacity
· Burstable Option: 95th percentile is available, 20% of the port size to be committed

Advantages

· Extended Global Internet connectivity with reduced level of latency
· Cost effective Internet access with improved quality
· Easy and convenient entry for peering relation with Remote IX Access
· High-performance guaranteed SLAs
· Centralized end-to-end network management
· Low latency traffic routing
· Fast delivery lead times
· Responsive and experienced customer service
· 24x7 proactive monitoring and help desk

Remote IX Access Service

▶ Overview

TTI's Remote IX Access Service is the "one-stop-shop" solution for peering at the biggest Global Internet Exchange Points (IXs). The service enables customers to become remotely connected to the IXPs without having their own or leased infrastructure and hardware.

Remote IX Access service offers the easiest access to IXs and a convenient entry to peering with other networks which are connected to the IXs. All customer relationship including sales, contracting, billing, and first line customer care is provided by TTI.

▶ Features

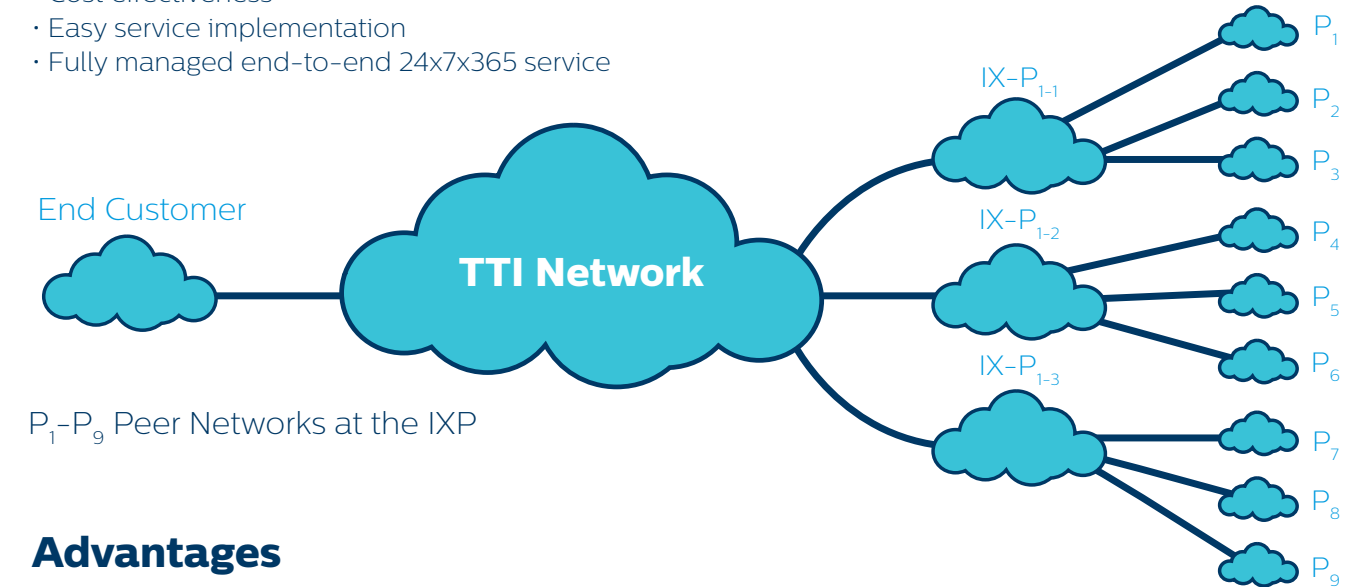### Connection to Physical Ports of IXs:

Customers are connected to TTI core backbone network where the traffic is delivered through and handed over at the IX's Access Switch with dedicated bandwidth options of 1G, 10G, and 100G.

IX Access via Virtual Links:

Customers are connected to TTI MPLS core network where the traffic is identified by VLAN tags and delivered to the IX peering platform. Bandwidth options of Virtual Links are 100M, 250M, 500M, 750M, 1000M, 2500M, and 5000M.

TTI Remote IX Access Service provides:

- Secure and private connection
- Transparent transport
- Cost effectiveness
- Easy service implementation
- Fully managed end-to-end 24x7x365 service

End Customer

TTI Network

$IX-P_{1-1}$

$IX-P_{1-2}$

$IX-P_{1-3}$

P_1 P_2 P_3 P_4 P_5 P_6 P_7 P_8 P_9

P_1-P_9 Peer Networks at the IXP

Advantages

- OSS solution: only one party, TTI, rather than several parties (carrier, colocation, equipment vendor, Internet Exchange)
- Cost effective solution to reach the Internet Exchanges with low initial traffic level
- Easy and convenient entry for peering relationships
- No formal relationship required with colocation facilities
- Highly secure, transparent end-to-end connection
- Guaranteed service level agreements
- Wide geographic coverage with terrestrial and submarine cables (SMW-3, MedTurk, AMEER)
- Responsive and experienced customer service

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Colocation Service

▶ Overview

TTI offers carrier level co-location service that enables customers to place their telecommunication and datacenter equipment in TTI's state-of-the-art co-location centers. Rackspace or footprint services are provided along with high-speed connection to TTI's IP services. Co-location service is available at various levels thus customers can choose which activities they want to outsource to TTI and which to perform themselves.

Co-Location

· Footprint
· Rack
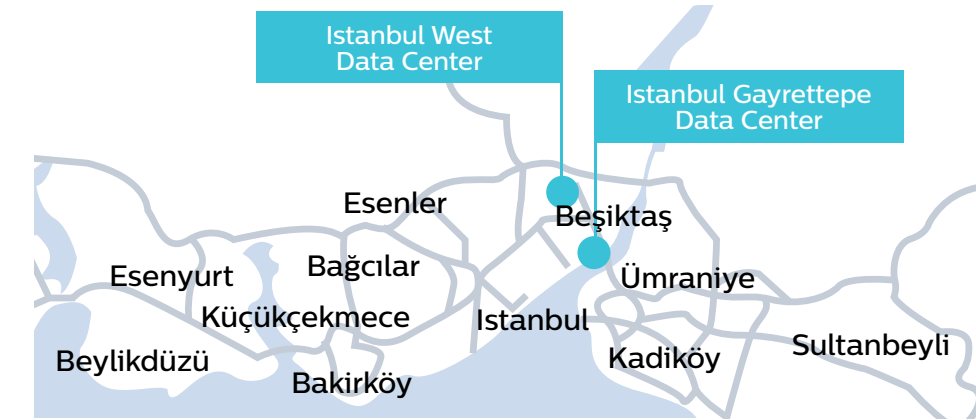· Shelf
· In-house Cabling

Features

· Full-redundant, resilient power supplies
  and cooling systems
· Flexible configurations and power volumes
· Maximum diversity and separation of UPS
  system and power distribution
· Separated, stand-alone UPS systems
· Climate-controlled environment with
  redundant capacity
· High sensitivity smoke detection systems
· Secure, monitored single-person entry
· Alarm system secured building areas
· Cabling for power and service

Location

In the middle of Tukey's
biggest business districts

· Excellent accessibility to site
  acces to Istanbul Anatolian
  side ~10 km
· Istanbul strait (Bosphorus) ~5 km
· Airport (~30 min)

Istanbul West Data Center

Istanbul Gayrettepe Data Center

Esenler
Beşiktaş
Esenyurt
Bağcılar
Ümraniye
Küçükçekmece
Istanbul
Beylikdüzü
Kadiköy
Sultanbeyli
Bakirköy

Advantages

· Cost effective Data Center operations
· Discount options on volume
· Up to 99,999% availability on power supply
  and air conditioning
· 24x7 operation and maintenance, remote-hand service
· Multiple connections to optical backbone
· Risk mitigation via experienced and professional team,
  unlimited data communication capacity and safe environment
· Easy and fast connection to TTI's wide-range
  product portfolio (Leased Line, Wavelength, IP, IPVPN, Ethernet,
  Dark Fiber)
· Rapid and price-effective access to Submarine Cables
  (SMW3, SMW5, MedTurk, etc.) and to the region
  (Iran, Iraq, Azerbaijan, Georgia, etc.)

Türk Telekom International

TTI NOC

Türk Telekom International NOC ensures the excellent quality of the customer services.

· Single point of contact for all operation issues all customers, all services, all geographical areas
· 7x24 availability
· Bilingual communication (English and German)
· Engineers directly available for customers
· Service Managers dedicated to customers
· Proactive network management
· Direct control over 3rd party providers

Voice Services

International Wholesale Voice

Prepaid Voice Service

The prepaid platform where you are in control

· Responsible for the commercial management of Türk Telekom's international voice traffic as well as its own wholesale voice operations.

· Over 150 interconnections worldwide with mobile operators, Tier 1 operators/ incumbents and leading alternative operators.

· Focus on High Quality Services ensuring the end user experience is as good as possible.

· Continuous development and growth designed to cater to customers' needs.

· Unique coverage of voice interconnections and hard to reach destinations.

· Main strengths are Turkey, Eastern Europe, CIS, Middle East, Far East and Africa.

· TTI introduced its newly established Hong Kong POP for closer interconnection points for Far East partners.

· Focus on Africa as traffic between Turkey and Africa continues to grow.

· High quality direct routes via TDM and VoIP to ensure the quality required by our customers.

· Flexibility, short response times, simple processes, strong team work.

Join our high quality direct network with access to Turkey, Middle East, Far East, Central and Eastern Europe, CIS, North and Sub Saharan Africa.

· Simple, secure and **fast sign-up** process
· Lower your costbase, **uplift** your service **quality** and **improve** your **customer experience**
· You are in **full control of your funds**: top up or withdraw money anytime you wish
· **Dedicated account manager** at your service
· Detailed **online reports**, billing and 24/7 NOC
· No hidden fees, **no credit checks**, no financial commitment

Visit and watch our tutorial video at http://trading.turktelekomint.com

Email: ws.prepaidvoice@turktelekomint.com

Türk Telekom
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International Roaming and Mobile Services

Management of roaming partnerships with all GSM/CDMA operators and MVNOs globally for Türk Telekom Group's mobile operator Avea.

- · International roaming agreements with 695 operators in 206 countries, 3G Coverage in 167 countries

Management of commercial negotiations and deals with GSM/CDMA operators globally to reach preferred roaming partnerships.

- · Bilateral discount agreements with 110+ mobile operators in 2015

Involvement in synergy projects and partnership management with GSM Alliances.

- · Commercial Member of Bridge Alliance operating in Asia Pacific as of October 2015

Commercial Management of international SMS interconnection with SMS Hubs and SMS aggregators.

- · Direct SMS Interconnection Agreements with 34 Operators

Coordination of proactive network management to ensure high quality inbound and outbound roaming, mobile originated international voice and sms.

- · Global Roaming Quality (GRQ) testing tools are used

Our Advantages

- · Optimum LTE spectrum portfolio and largest market share in <2 GHz spectrum in Turkey

- · 206.000 km fiber infrastructure covering all of Turkey (far beyond EU countries and US) which will enable quick roll-out of LTE

- · Wide range of discount options can be offered based on any combination of voice, sms, data roaming volumes and/or invoice amounts

- · Tailor made special discounts based on operators' needs fulfilling their end customer propositions' requirements, eg. Aggressive discount for data for unlimited data roaming plans.

- · Agile testing of international roaming agreements with a dedicated and operator focused team

- · Ability to do cost-efficient cooperation with roaming partners through a shared set of QoS KPIs

- · Fast resolution of home and visited networks' SLA violations through periodic proactive testing and reactive monitoring

- · Flexibility in commercial models for SMS interconnection agreements aiming win-win

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Bulk SMS Service

TTI has access to more than 100 different connections to SMS aggregators and MNOs worldwide.
The SMS prices are depending on your chosen price plan: direct or wholesale quality.

TTI Bulk SMS service benefits:

· **No additional** hardware or other **pre-investment** required
· **Real-time** reports on SMS sent, destinations used and credit balance
· **SMPP**-interconnection
· SMS **Filtering** service available
· **Worldwide SMS delivery** of very large message volumes
· **High termination speed:** quick-delivery of SMS
· 24/7 availability, **customer-specific SLA** options possible
· Fast and **competent support** through individual customer care

Email: sms@turktelekomint.com

Our Strengths

· Unified services and SPOC customer handling across the whole service area

· Guaranteed SLA-s

· Extensive geographical coverage

· Local experts and dedicated staff

· Centralized end-to-end network management

· Trustworthy and reliable attitude: delivering on commitment

· Track Record in the CEE region, Turkey & ME

· Experienced Management Team

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