

# Ethernet

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# Metropolitan Area Network

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Ein **Metropolitan Area Network (MAN)** ist ein breitbandiges Telekommunikationsnetz.

Üblicherweise verbindet ein MAN zahlreiche Local Area Networks und verwendet dazu eine Backbone-Technologie, die meist in Glasfasertechnik realisiert ist. Ein MAN kann eine Ausdehnung bis zu 100 km haben.

MANs werden oft von international tätigen Telekommunikationsfirmen aufgebaut, die dann auf diese Weise verkabelte Metropolen wiederum in einem Wide Area Network (WAN) national oder in einem Global Area Network (GAN) sogar international wieder vernetzen.

In Deutschland wurde ein entsprechendes Netz unter dem Namen Datex-M von der Deutschen Telekom im Jahre 1992 in Betrieb genommen, das die so genannte SMDS-Technik benutzte (*Switched Multimegabit Data Service*). Ende 2002 waren in Berlin, Düsseldorf, Frankfurt am Main, Hamburg, Hannover, Köln, München und Stuttgart Metropolitan Area Networks der Deutschen Telekom in Betrieb. Zu diesem Zeitpunkt waren bereits 26 deutsche Städte in paneuropäische GANs eingebunden.

Inzwischen existieren sogar in fast allen deutschen Großstädten Netzwerke auch in anderer Technik als der SMDS-Technik, die in verschiedensten Netztopologien die Stadtteile miteinander verbinden, die eine hohe Bürodichte aufweisen. Es gibt außer dem ehemaligen Monopolinhaber Deutsche Telekom etwa 20 (Stand: 2004) weitere Netzbetreiber in Deutschland, die für diesen Zweck Glasfasernetze verlegt haben, inzwischen vorzugsweise in der Technik Synchroner Digitale Hierarchie (SDH).

Eine spezielle Technik für Glasfasernetze im Metrobereich ist Metro Ethernet.

IEEE 802.16 hat einen Standard für **Wireless** Metropolitan Area Networks entwickelt, der unter dem Namen WiMAX (Worldwide Interoperability for Microwave Access) etabliert ist und eingesetzt wird<sup>[1]</sup>.

## Einzelnachweise

- [1] IEEE 802.16 Working Group on Broadband Wireless Access Standards (<http://www.wirelessman.org/>) developing the IEEE 802.16 WirelessMAN® Standard for Wireless Metropolitan Area Networks

## Literatur

- Andrew S. Tanenbaum: *Computernetzwerke*. 4. überarbeitete Auflage. Nachdruck. Pearson, München u. a. 2009, ISBN 978-3-8273-7046-4, (*Pearson Studium*).

## Weblinks

- Lammermann.eu: Metropolitan Area Networks (<http://www.lammermann.eu/wb/pages/arbeiten/metropolitan-area-networks.php>)

# Backbone (Telekommunikation)

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**Backbone** (engl. für *Rückgrat*, *Hauptstrang*, *Basisnetz*) bezeichnet einen verbindenden Kernbereich eines Telekommunikationsnetzes mit sehr hohen Datenübertragungsraten, der meist aus einem Glasfasernetz sowie satellitengestützten Kommunikationselementen besteht.

## Hintergründe

Da sich im Backbone-Netz die Bandbreiten aller Endbenutzer bündeln, erfordert dieses Netz besonders große Bandbreiten und schnelle Übertragungsraten. Gleichzeitig sind besondere Sicherheitsvorkehrungen und gewollte Redundanzen notwendig, um bei Teilausfällen im Backbone die Datenströme entsprechend umleiten zu können.

Neben den klassischen Telekommunikationsunternehmen, insbesondere der Deutschen Telekom, verfügen auch die Kabelfernsehnets-Betreiber sowie die großen Energieversorger, z. B. die E.ON, über große Glasfasernetze im Backbone-Bereich<sup>[1]</sup>. Für letztere verursacht die Mitverlegung von Glasfaserkabeln bei dem Bau bzw. der Umrüstung von Pipelines oder Hochspannungsnetzen einen vergleichsweise geringen Aufwand.

## WAN (Wide Area Network)

Im WAN-Bereich weist der Begriff „Backbone“ auf das verbindende Kernnetz in einer hierarchischen Netzstruktur hin, das meist gegen Ausfälle durch Dopplung seiner Komponenten (Redundanz) geschützt ist.

Über die Verbindungen des Backbones wird den Mitgliedern verschiedener Anschlussnetze (verschiedene Provider, universitäre, staatliche und firmeneigene Verbindungseinrichtungen) ermöglicht, miteinander in Verbindung zu treten.

Backbones sind breitbandige Hochgeschwindigkeitsverbindungen zwischen Netzknoten. Viele dieser Netzknoten dienen lediglich dem Betrieb des Backbone (zum Beispiel Routing). Andere Knoten bilden die Übergangspunkte in die untergeordneten unabhängigen Netzsegmente der Anschlussnetze.

## LAN (Local Area Network)

Im LAN-Bereich spricht man von einem Gebäude-Backbone oder Coreswitch und meint damit den Teil einer strukturierten Verkabelung, der die Geschosse verbindet, oder auch nur Backbone, dann meint man das Gelände-Netz, das mehrere Gebäude verbindet.

Speziell in der Stockwerksverkabelung wird zwischen zwei Arten unterschieden:

### Collapsed Backbone

Beim Collapsed Backbone handelt es sich um ein virtuelles Backbone, der in einem Kopplungselement wie einem Router oder einem Switch bzw. in dessen Backplane gebildet wird. Durch die wenigen aktiven Netzkomponenten ist ein zentrales Management des Backbones möglich, was zu einer einfachen Wartung und damit einem zuverlässigeren, sichereren Netz führt. Außerdem verbessert ein Collapsed Backbone die Gesamtleistung des Netzes und erleichtert den Übergang zwischen Netzformen von LANs und WANs. Der einzige Nachteil des Collapsed Backbone liegt in der Tatsache begründet, dass bei einem Geräteausfall die Kommunikation sämtlicher Tertiärbereiche zusammenbricht.

## Distributed Backbone

Distributed Backbones sind eine eher veraltete Variante. Hier werden die einzelnen Etagenverteiler über einen Ring verbunden, der innerhalb der strukturierten Verkabelung auch durch den Gebäudeverteiler laufen muss. Früher wurden hierfür 10Base5 oder FDDI eingesetzt. Da der Backbone ein eigenes Subnetz bildet, müssen innerhalb der Etagenverkabelung Geräte auf Schicht 3 des OSI-Modells eingesetzt werden, um eigene Subnetze zu generieren. Dadurch wird außerdem das Management und die Bildung von gebäudeübergreifenden VLANs erschwert.

## Weblinks

- Mapnet <sup>[2]</sup> (Java Applet zur Visualisierung weltweiter Backbone Verbindungen)
- belwue.de <sup>[3]</sup> (Übersichtskarten zur Infrastruktur eines deutschen Backbones)

## Einzelnachweise

- [1] *E.ON Hanse und die sacoin GmbH ermöglichen Internetversorgung für Gemeinde Oering.* ([http://www.eon-hanse.com/pages/eha\\_de/Presse/Pressemitteilungen/Aktuelle\\_Presse/Pressemitteilung.htm?id=1400587](http://www.eon-hanse.com/pages/eha_de/Presse/Pressemitteilungen/Aktuelle_Presse/Pressemitteilung.htm?id=1400587)) Abgerufen am 3. Juni 2011.
- [2] <http://www.caida.org/tools/visualization/mapnet/Backbones/>
- [3] <http://www.belwue.de/ueberuns/netz/gbit-netz/fohlen.html>

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