








	Companies* 	Value Proposition 	Key Highlights 	Growth Directions 
 <b>Tower</b>	<ul style="list-style-type: none"> <li>China Tower</li> <li>Cellnex</li> <li>American Tower</li> <li>Crown Castle</li> <li>IHS Towers</li> <li>TDF Infra</li> <li>Bharti Infratel/Indus</li> <li>SMN (Protelindo)</li> <li>Summit Digitel</li> <li>Tower Bersama...</li> </ul>	<ul style="list-style-type: none"> <li>Help customers shift capex to opex</li> <li>Accelerate time to market</li> <li>Lower cost of capital</li> </ul>	<ul style="list-style-type: none"> <li>Top contributor to CNNO revenues in 2022, at 57% of total; strongest YoY growth (+8%)</li> <li>Database captures 3.3M towers globally, all owned by "tower" specialists; China Tower dominates</li> <li>Capex at ~28% of revenues in 2022, in line with last few years; always some M&amp;A underway.</li> </ul>	<ul style="list-style-type: none"> <li>Higher sharing/tenancy rates</li> <li>Improved operational efficiency</li> <li>More scale in core market</li> <li>Fiber expansion to support small cell and other services</li> </ul>
 <b>Data center</b>	<ul style="list-style-type: none"> <li>Digital Realty</li> <li>Equinix</li> <li>GDS Data Centers</li> <li>CyrusOne (est.)</li> <li>ChinData</li> <li>QTS Realty (est.)</li> <li>Switch</li> <li>DigitalBridge</li> <li>NEXTDC</li> <li>21Vianet (VNET)...</li> </ul>	Provide outsourced data center space in good locations, powered efficiently, with interconnection to other networks and clouds	<ul style="list-style-type: none"> <li>Accounted for 24% of CNNO revenues in 2022, up a bit YoY; lots of private activity and new builds</li> <li>1,224 DCs in our database; several non-DC specialists own them (Am Tower, Internap, Cogent)</li> <li>Capex over 50% of revenues in 2022 for the 7th straight year</li> </ul>	<ul style="list-style-type: none"> <li>Develop existing property</li> <li>Seek out attractively priced assets and companies to extend reach</li> <li>Build out edge to support 5G &amp; hyperscale in core to complement webscale cloud networks; optimize energy cost &amp; fuel mix</li> </ul>
 <b>Bandwidth</b>	<ul style="list-style-type: none"> <li>NBN Australia</li> <li>Level 3</li> <li>Zayo</li> <li>Uniti Group</li> <li>Chorus Limited</li> <li>Cogent</li> <li>Internap</li> <li>Superloop</li> <li>Historic data only: GTT and Lumos</li> </ul>	Help telcos extend the reach and performance of their networks, economically	<ul style="list-style-type: none"> <li>Revenues fell 10% in 2022, ~19% of CNNO revs</li> <li>CNNOs own 961K route miles of fiber, most by "bandwidth" specialists but 30% owned by others e.g. Crown Castle, EI, TDF, Indonesian tower cos</li> <li>Segment capital intensity was 30% in 2022, quite a bit lower than recent past due in part to NBN</li> </ul>	<ul style="list-style-type: none"> <li>Consolidation</li> <li>Small cells</li> <li>Edge computing</li> <li>Open access FTTx</li> </ul>

\*Companies with the highest 2022 capex figures are shown, in rank order; for a full list, see the "About" tab