USIGNITE

TECHNOLOGIES & BENEFITS

Technology	Description	Possible Breakthrough	Other Benefits
Software Defined Networking Virtualization of Networks SDN	A single physical network can be virtualized into multiple "slices" or logical networks, each isolated from one another and customized to specific applications or uses. Because this is carried out in software, new slices can be created dynamically as needed. Traffic within slices can be carried at either layer 2 or layer 3. Layer 2 traffic doesn't require the overhead of IP. The control plane is separated from the data plane, and flows of packets are managed as the basic unit of routing instead of individual packets. When identical information (e.g. video packets) are sent to multiple locations, only one flow of packets is sent to the in-network branching points	1) Situational extra channels (and bandwidth) to homes and businesses if and when needed for home healthcare and education applications 2) New application-based business models for network providers are enabled 3) Network provides isolation between slices; benefits to financial applications, healthcare privacy, and public safety users 4) Situational public networks can be created as needed – such as disaster response quickly using existing commercial resources	1) End-to-end flow optimization 2) Lower costs for switching 3) Isolation between slices enhances security 4) Smoother traffic flows 5) Scheduling and traffic management on a per-flow basis 6) Efficient collaborative applications flows (multiple sites) 7) "Future-proof" new networks
Local Cloud Resources	"US Ignite Racks" placed at strategic locations in the network provide programmable, low-latency, local computing and storage capabilities. A US Ignite Rack = OpenFlow + OpenStack that can be partitioned and made a part of multiple slices as needed to best support the application. Because these "cloud" resources are located throughout the network, they can reduce latency for application services and keep unnecessary traffic off upstream backbones. In some ways, US Ignite racks are programmable generalizations of today's Content Distribution Networks.	1) Can enable direct manipulation applications over the local network 2) Cost-effective virtualization of public-benefit applications 3) Enables responsive evaluation of complex models, such as AutoCAD 4) Home users can work with "big data" models without expensive scientific workstations 5) Platform for integrating big data from local sensors (such as multiple video feeds) to make more informed decisions (e.g. transportation signals; emergency evaluation and response)	1) Improved application response time 2) Lower upstream ISP costs 3) Local cloud resources are likely to be unaffected by natural disasters 4) Cost effective way of provisioning public services

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Gigabit to End-User	End-to-end gigabit bandwidth to the end-user workstation, desktop, or laptop facilitates the movement of multi-gigabit data visualization and uncompressed high definition video. In addition, gigabit bandwidth to US Ignite Racks makes the resources appear to be part of the highly responsive local facilities available to the end-user.	1) Natural and ubiquitous videoconferencing based on uncompressed, low-latency, high definition video streams. 2) Enables direct manipulation applications over the local network (if coupled with local cloud) 3) Virtual supercomputers are created by linking dozens or hundreds of smaller home or business computers over a gigabit mesh fabric interconnect. 4) Applications integrating multiple high-definition video streams (e.g. transportation vehicle and pedestrian models) 5) Provide the physical bandwidth needed to dynamically add software defined networking slices to any given location on demand (e.g. to support public safety) 7) Enable your digital support system resources to follow you when you decide to travel on the spur of the moment	1) Applications that would use a lot of bandwidth suddenly become cost-effective when bandwidth isn't scarce and expensive. 2) Keep local and cloud-based copies of your digital resources in sync. 3) Allow nearly instantaneous delivery of large digital resources like video files that now take minutes or hours to upload / download 4) Establish permanent video walls that create "wormholes" between geographically-distant locations (e.g. link branch offices of businesses with headquarters)