

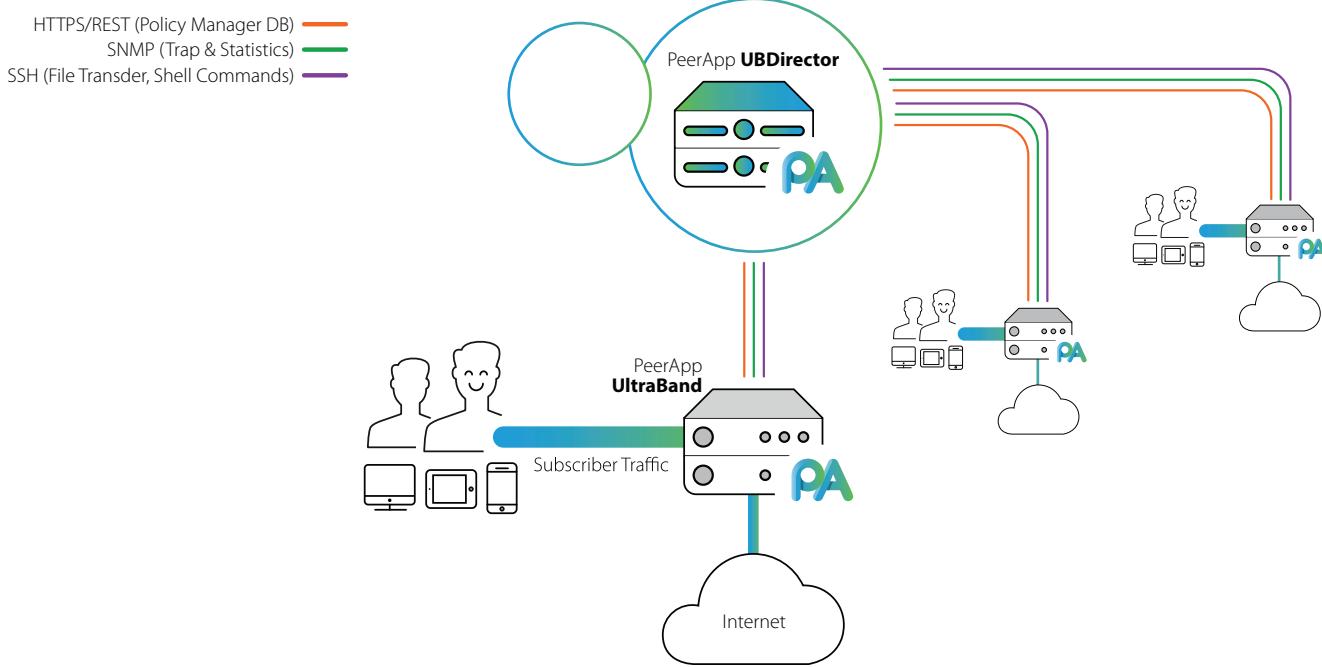
UBDirector™ Unified Management System

Market Challenge

Consumption of Internet video and other OTT (over-the-top) content has exploded to the point of creating strain on networks of all types – mobile, cable, telco/ISP and college/university. This strain is resulting in poor subscriber Quality of Experience (QoE) even in advanced broadband and 4G/LTE environments. In addition, dynamic events such as the World Cup and software updates, like iOS, or new game introductions cause traffic spikes that also impact the subscriber experience, a key factor in customer retention.

500 network operators around the globe have invested in the PeerApp UltraBand® open content caching solution to relieve network strain and delivery content faster to end subscribers/customers while at the same time lowering costs.

Many customers have multiple UltraBand systems deployed (to manage multiple Terabits per second of traffic and/or to support a distributed topology). For those customers, PeerApp now offers a single system – UBDirector - to unify management across these multiple systems, as well as provide intelligence and analytics around content and traffic. UBDirector can be provided as a stand-alone system, or as a virtualized instance over Consumer off-the-shelf (COTS) hardware, reducing total cost of ownership (TCO).



UBDirector Unifies Management and Brings Business Intelligence

UBDirector monitors and maintains multi-UltraBand deployments and offers analytic capabilities.

Using graphs and statistics, UBDirector enables monitoring of caching performance, central management of group policies (business rules), and application of common configurations across multiple POPs (points of presence). UBDirector helps to reduce operational costs, save time in system operation and maintenance, and enables monitoring of issues that might affect customer satisfaction. It achieves these benefits through 4 main system capabilities:

Network Performance Maintenance

Through a detailed system dashboard, UBDirector provides an intuitive, centralized place to view event logs and performance of individual servers, as well as aggregate system-wide information such as overall traffic and system alerts. Alert conditions and thresholds are customizable, and alarm logs can be filtered to provide the right view to match business needs.

UBDirector also provides a single place to view and monitor cross-system health metrics. With this information, operators can take proactive action to troubleshoot areas of decreased performance, improving system efficiency and lowering total cost of ownership. Information provided by UBDirector also improves service availability and mean time to repair (MTTR).

Aggregated Statistics

Relevant productivity statistics can be viewed at several levels: across the aggregate of all connected systems, across sub-groups, or at an individual

system level, enabling tracking of relevant KPIs so that productivity adjustments can be made as needed. For example, observe protocol or content source changes (due to seasonality, popularity, and the like) and adapt traffic policies accordingly. Or, monitor QoE-related metrics and adjust to retain a high level of QoE, a key driver of customer satisfaction.

Additional aspects to the aggregated statistics are Prime Time reports and Comparison reports. With Prime Time reports, operators gain the ability to view caching performance during peak traffic times and analyze traffic demographics during different time periods. This information can serve as a KPI for traffic optimization during network congestion periods. Comparison reports allow 'side-by-side' or aggregated views of the same data over different time periods and/or different systems to detect differences and any needed network or system adjustments.

Centralized Administration

Remote access and single sign-on to any networked system through UBDirector. Manage roles and privileges and apply them to any system user. Tackle system maintenance and update issues from a single point. Create groups of systems (e.g. by geography, or by customer type).

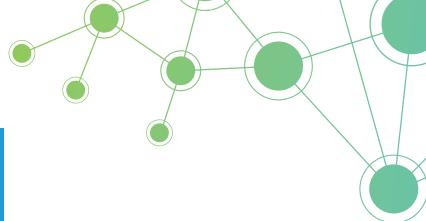
Unified Policy Management

UBDirector provides a single place through which operators can define and apply UltraBand policies in support of their own unique business rules (for example, set bandwidth thresholds, cache control and admission policies). Once defined, policies can be updated in the same centralized place. Policies and rules may be either propagated across groups, or individually configured with a unique settings.

Through the above capabilities, UBDirector covers the five FCAPS functions of: Fault, Configuration, Account, Performance and Security Management. And, of course, for each of the areas, data can be easily exported and reporting can be automated through scheduling.



UBInsight™ - Optional content analytics module



In addition to offering the network management capabilities described above, UBDirector offers an optional content analytics module. This module was previously offered as a stand-alone product (UBInsight). Combining the power of UBDirector and UBInsight provides operators with a range of choice in how best to meet their content management needs as well as hardware use efficiency, bringing cost, power and footprint savings.

Reporting

Out of the box, UBInsight provides a variety of standard reports that show trends in content traffic and caching performance. UBInsight compiles a massive body of data and presents it in visual graphs that can be readily understood by stakeholders throughout the organization.

Reports are available in a variety of formats from web page dashboards, to PDF and HTML. Report packages tailor views for every level of the organization providing the right information at the right time. Dashboard views summarize information with quick view navigation. Standard reports can be modified and custom reports can be created via a flexible data mining tool. Graphs and data can be exported to Excel, PowerPoint, PDF, web and raw data formats for use in other applications.

Ad-hoc data access provides users with the tools to isolate specific systems, regions, services, protocols and date ranges.

Network Engineering Module

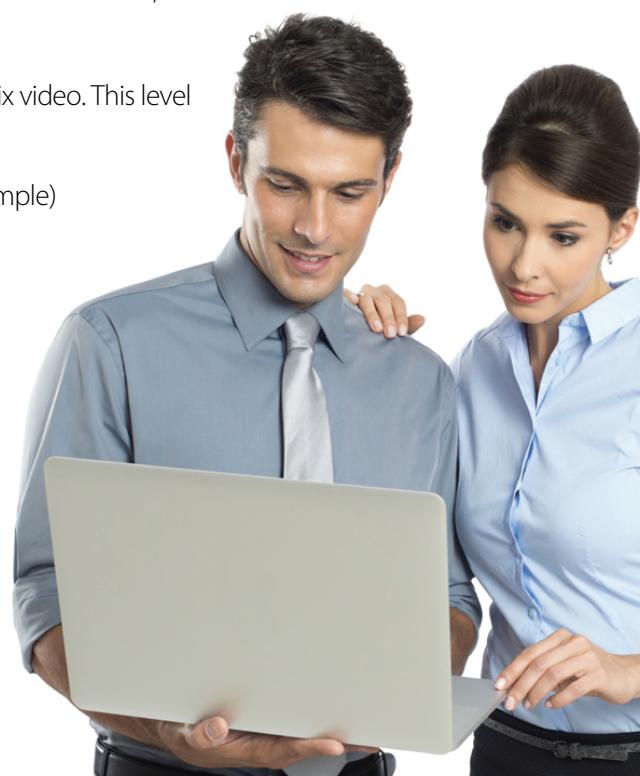
UBInsight's Network Engineering Module helps engineers and planners understand the changing composition of content traffic in the network, and the impact of caching on traffic load and subscriber QoE. Network personnel can observe traffic by a variety of parameters including service, originating domains and URLs. Content can be examined down to an atomic level, including a unique web object lookup feature that identifies the originator and content of any web object.

Cache impact is shown through a number of graphical reports including cache productivity, byte hit ratio (BHR), and QoE by service, protocol, or object size. Reports and data can be obtained for the network as a whole, for defined zones, POPs, or single systems. Sample reports include:

- Domains and objects analysis, for example identifying the most popular Netflix video. This level of detail is not available by DPI analytics
- Traffic breakdown by web categories, based on URL categorization engine
- All download sites for specific movie (for copyright violation searches, for example)
- Most popular Bit Torrent downloads
- Top Subscribers and Top Devices (for use in planning offers, promotions and packages)

Policy Module

Provides analysis of UltraBand policy manager entities (e.g. categories, policies and rules). The UltraBand policy manager is a configurable tool within the UltraBand cache that enables to classify traffic based on IP, string matching on several HTTP headers (e.g. URL, Host, User-Agent, Referrer). In addition, it enables the user to configure rules and various policies on traffic like admission control (e.g. block, don't cache, redirect), bandwidth control, DSCP coloring. The UBInsight Policy Module provides analysis on these user-customized traffic categories and policy hits.



Technology Module

The Technology Module performs analysis of end-point devices from the perspective of Operating Systems, browsers used and device types. For example:

- Distribution of Firefox v. Chrome in the network
- Usage (in percentage terms) of each operating system
- Usage changes over time
- Adoption level of specific devices by the subscriber base
- Number of devices per subscriber

Virtual Network Delivery Module

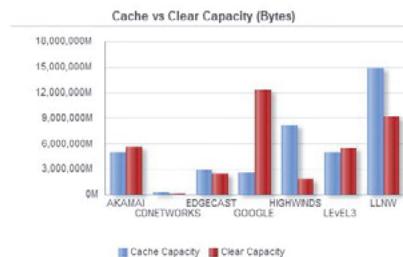
This module focuses on analysis of the inputs to the cache: by Autonomous System Numbers (ASN)*, by Content Delivery Network (CDN), by country, etc. Information to be gained includes:

- How bandwidth policies affect traffic for specific hours of the day
- ASN and countries analysis
- From which country do most software downloads originate
- Which is the most popular ASN at the network.

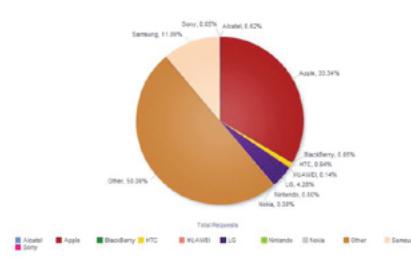
*ASN is a collection of Public IP routing prefixes under the control of one or more network operators on behalf of a single administrative entity.

Marketing Module

UBInsight's optional Marketing Module helps operators focus on the content consumption patterns of their subscribers. It reveals which services and content types are popular for different groups of subscribers based on time of day, and subscriber attribute. When integrated with a RADIUS or Diameter server, UBInsight becomes part of the infrastructure for tiered service offerings with comparisons between types of users and top subscriber analysis, with visibility into QoE across multiple dimensions.



In this chart, we see the source of incoming traffic. Clear capacity (red) goes directly to subscriber from Internet/CDN. Cache capacity (blue) is served through PeerApp. In this case, the operator also had a Google cache in their network. Even with that, PeerApp is caching Google traffic (as seen by the blue 'cache capacity' bar for Google traffic).



This report shows which devices are accessing the most content on the network. This can help an operator understand devices penetration in their network. This information could be used to create device/traffic packages, potentially including revenue share arrangements with the device manufacturer.

UBDirector Magnifies Value

UBDirector expands the value that PeerApp brings to operators by:

- Reducing operational costs through consolidation of traffic monitoring and network capacity planning
- Saving valuable time in system operation and maintenance through single point of access, consolidation of logs and events, centralized policy management, alerts and notifications
- Increasing customer satisfaction and Quality of Experience through QoE monitoring and content source filtering
- Increasing the understanding of trends among services, content types and subscribers through powerful analytics and reporting which can guide business decisions

About PeerApp

PeerApp delivers open, virtualized solutions for local delivery of Internet video and other OTT content that speed delivery by bringing content closer to end-users, enabling subscriber Quality of Experience (QoE), lowering cost, and opening service delivery opportunities. The solutions are based on PeerApp's market-leading content caching and analytics. With PeerApp, operators have accelerated content delivery 12x or more, and reduced network costs by 50% or more, maximizing the opportunity associated with the explosion of Internet content consumption. PeerApp has 500 deployments in more than 80 countries managing an aggregate capacity of 5 Terabits per second capacity, including multiple Tier1 deployments on a 100-500Gbps scale.