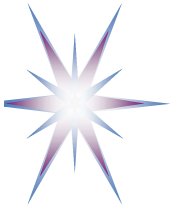
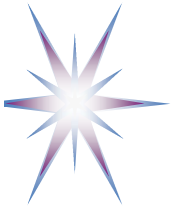


Panel
"Clouds Meet Energy and Resources Savings for Society Services"

Moderator
Yuri Demchenko, University of Amsterdam, Netherlands

Panelists
Wolf Zimmermann, University of Halle, Germany
Ethan Hadar, CA Technologies, USA
Steven Greenspan, CA Technologies, USA
Orazio Tomarchio, University of Catania, Italy
Yong Woo Lee, University of Seoul, Korea (* by slides)

CloudComputing2012
22--23 July 2012, Nice, France



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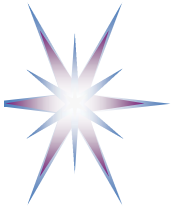

"Clouds Meet Energy and Resources Savings for Society Services"

Resource saving issue

- Cloud is actively pushed by business and aggressive marketing
  - Do we know any example of business activity (aka gold rush) that have been motivated by resource saving?
- Can cloud create new jobs? Indeed save something in one place without loosing in another place?
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  - Can cloud decrease digital divide?
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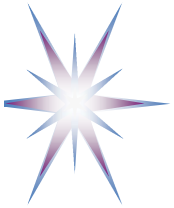

"Clouds Meet Energy and Resources Savings for Society Services"

Energy saving issue

- Is this a statement, intention, wish or discussion challenge?
- Is cloud computing becoming a dirty technology that brings ecology challenge?
  - Should we put cloud datacenters to still ecological clean places (tundra/polar, desert), or should we move/keep them at already devastated places like big cities and Chernobyl/Nevada zones?
- What real step has been done to contain ecology impact of the modern ITC and Clouds?
  - Is standardisation important? What to standardise?

Standardisation and Initiatives

- Standardisation is an important part of achieving community coordination to reach common goal
  - Especially in the technology area

- Existing standardisation in the area of “green” technologies
- GreenSonar BOF at OGF35 - 17-19 June 2012, Delft, NL

GreenSonar BOF at OGF35
17-19 June 2012, Delft, NL

- Sustainability requires Green-IT in all kinds of resources, compute, network, storage, sensor, …
- Measure to know; information needed for smart infrastructure.
- Basic idea: been there done that in Networking!
- Why not apply NM & PerfSonar methods and architecture to Green & Energy information?
- Need also application information.
- Big hurdle: energy metrics on heterogeneous resources
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Slides on GreenSonar BOF at OGF35 – Courtesy Prof. Cees de Laat (UvA)

ECO-Scheduling @ GreenSonar BOF OGF35

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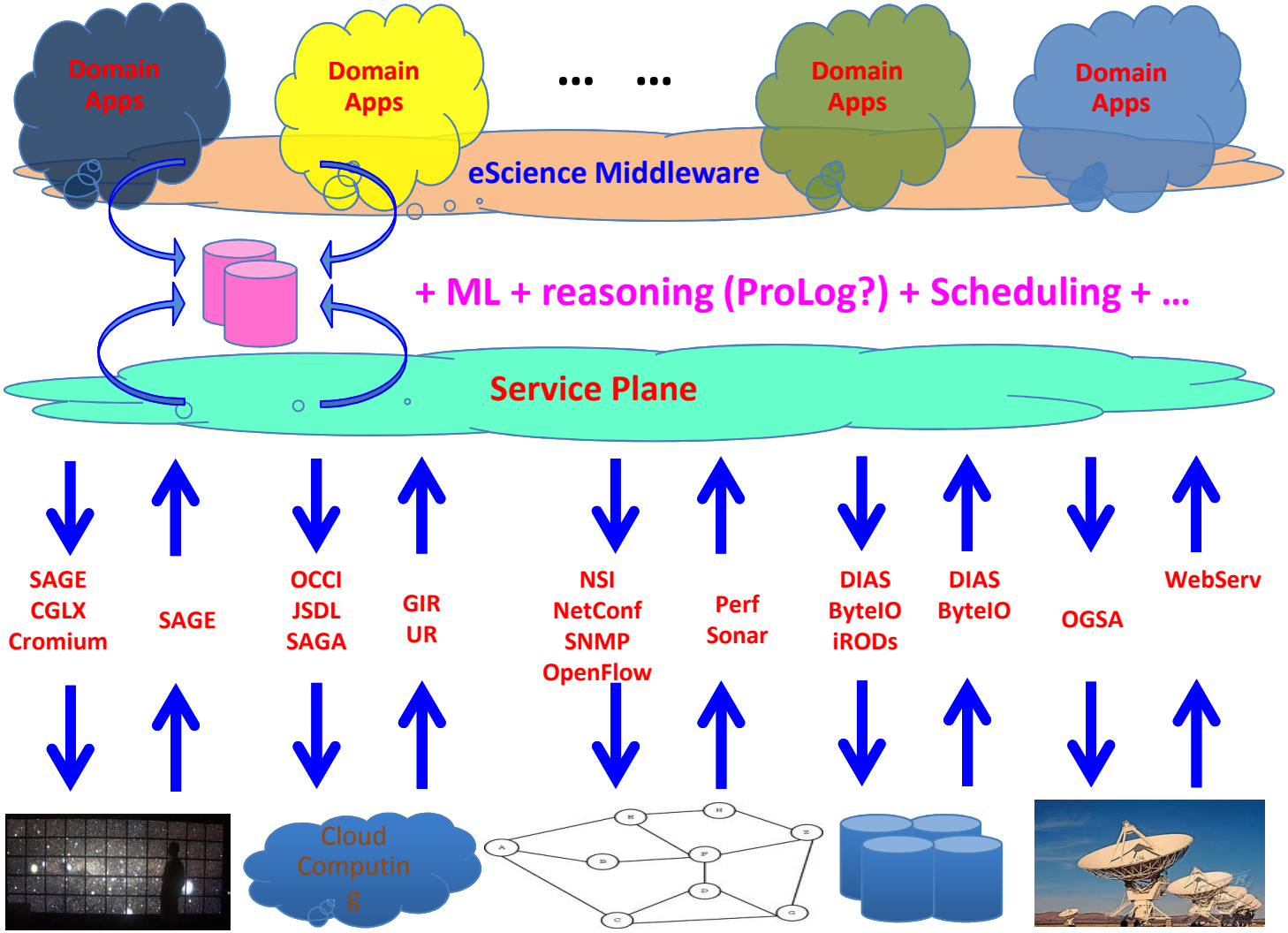
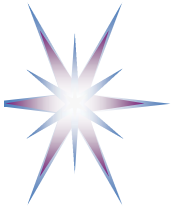
Technologies available – Complexity remains





Panel Summary

Panel Summary

- Software is an important factor of energy saving
  - Energy aware program engineering
  - However needs better tools and underlying hardware and OS platform information
- Market factors are key in shaping cloud technology to social and community needs
  - More offering of cloud resources will drive cloud move to more energy and resource saving
  - Current cloud and high performance communication technologies are still not energy saving technology
- Globalisation in cloud offering will involve customers' factor in pushing/moving clouds to resource and energy saving
  - Businesses themselves can not create critical factors here
  - When customers have a choice they will create these factors
- Transparency in cloud architecture and cloud applications will provide a basis for market feedback and regulation
  - This will allow to rise a so-called "cloud curtain" in cloud technologies
- Standardisation will play an important role in facilitating "green" technologies
  - We need both eco/green "navigator" and "taximeter"
- Cloud is a new technology, a new "living space" that we have not built before
  - We need many things to built in a new way
  - It provides a new virtual living space for people, communities,

ComputationWorld 2012
Cloud Computing/Service Computation Panel

Cloud Service Offerings in future public cloud markets

Orazio Tomarchio

Dep. Of Electrical, Electronic and Computer Engineering
University of Catania (Italy)

Current cloud market

- Which cloud platform should I use?
- Can I change if I am not satisfied?

Lack of interoperability → vendor lock-in problem

A future open cloud market

Improving interoperability

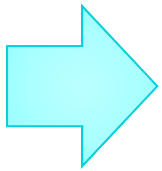
Increasing competitiveness

New providers – new (and more differentiated) cloud offerings

Customer can obtain better services

Providers perspective

- Diversification of cloud offerings to serve "at best" customers:
  - Price models
  - Quality of Service



SLA negotiation

- To reduce costs (also including energy savings):
  - Smarter resource management schemes
  - Need more info about customers application features

Customers perspective

- Mechanisms to identify and compare the ***value*** of offerings
  - New models to calculate and compare costs and revenue

- The user must/wants to be able to assess the quality of the provided services, in accordance with the contractual agreements

Customers perspective

How to effectively support the supply-demand matchmaking of cloud resources?

IMHO

- Methodologies, models, mechanisms and tools to favour:
  - The definition and advertisement of providers' offers
    (from a business point of view – price vs. quality)
  - The definition of the application requirements and customers' requests
  - Offer-request matchmaking

Semantic technologies and ontologies


Thank you for your attention ☺
Orazio.Tomarchio@dieei.unict.it

Do Clouds save Energy?

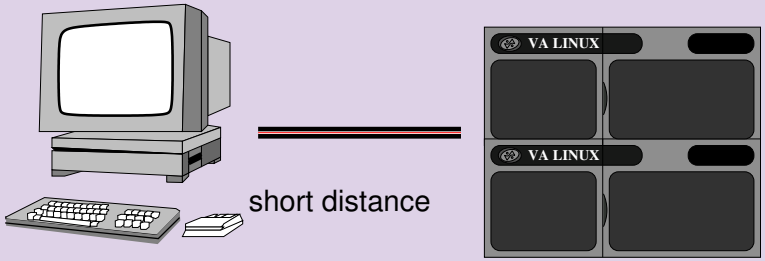
Wolf Zimmermann

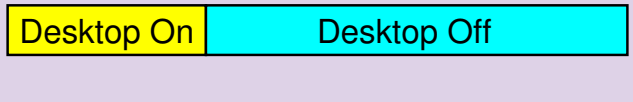
Martin-Luther-University Halle-Wittenberg

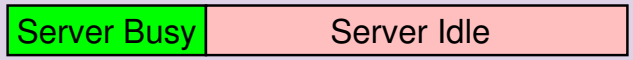
CLOUD COMPUTING 2012

Yes, Clouds save Energy and Resources

Traditional View







$$E = E_{Desktop\ On} + E_{Server\ Busy} + E_{Server\ Idle}$$

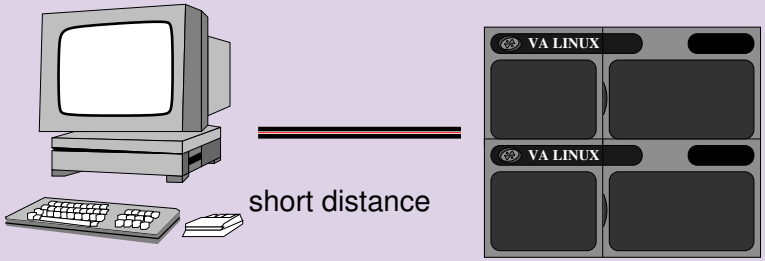
- Desktop is connected by LAN to a server
- Physical Machine

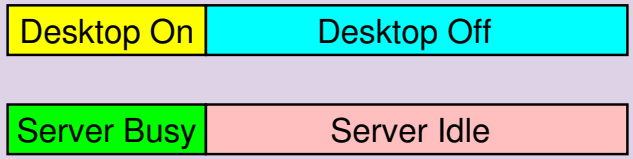
Virtual Machines and Cloud

- Desktop is connected to a cloud server

Yes, Clouds save Energy and Resources

Traditional View





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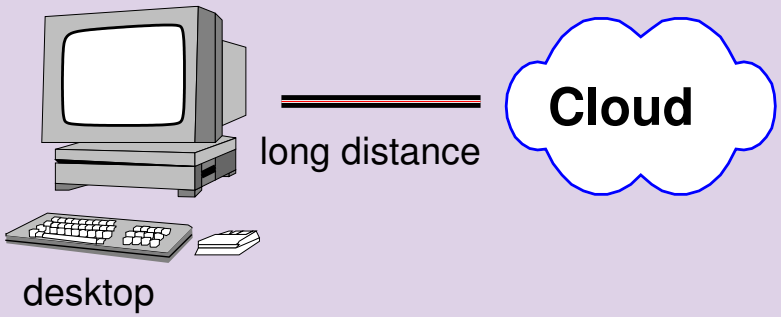

$$E' = E_{Desktop\ on} + E_{Transmission} + E_{VirtualMachine} + E_{CloudAdmin}$$

Remark: $E_{VirtualMachine}$ may vary by choosing adequate nodes

$\Rightarrow$ $E_{VirtualMachine} \ll E_{Server\ Busy}$ may be possible

- Desktop is connected to a cloud server
- Cloud starts virtual machine for the desktop

$\Rightarrow$ Idle times can be used by other clients

$\Rightarrow$ Requires clever scheduling

No, Clouds cost Energy and Ressources

Problem

$E_{VirtualMachine} \gg E_{Server\ Busy}$ may lead to more energy consumption using clouds

- Old technology for cloud servesr, modern energy-efficient technology for traditional servers
- A Traditional server is located in northern regions, the cloud server in southern regions

$\Rightarrow$ Traditional server consumes less energy due to air-conditioning

Software Service S on the Cloud

Traditional:

No, Clouds cost Energy and Ressources

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Software Service S on the Cloud

Traditional: $E = E_{S\ on\ Server} + E_{Desktop\ On} \cdot T_{S\ on\ Server} / T_{Desktop\ On}$

Cloud: $E' = E_{S\ on\ Cloud} + E_{Transmission} + E_{Desktop\ On} \cdot (T_{S\ on\ Cloud} + L) / T_{Desktop\ On}$

Observation

$E' > E$ is not unlikely to happen

Challenges

- Identification of the breakeven points between savings and additional costs?

☞ Requires adequate energy model

- Energy aware scheduling?
- Energy aware cloud administration?
- Energy consumption as a service quality/SLA?

⇒ Requires analysis of energy consumption of services on different devices and locations

☞ The same kind of observation and questions apply to other resources such as e.g. memory or execution time

Cloud Computing in the Ubiquitous City to Meet Energy and Resources Savings for Society Services

Presented by Yong Woo LEE, Ph.D.
The President of Ubiquitous City Consortium
Director of Seoul Grid Center
Professor, Univ. of Seoul, Korea
Chair, Korea National Standard Committee for ISO JTC1/ SC22
Vice President, Korea Internet Information Society

For the Cloud Computing 2012 Panel Discussion

2012. 7. 25

Ubiquitous City

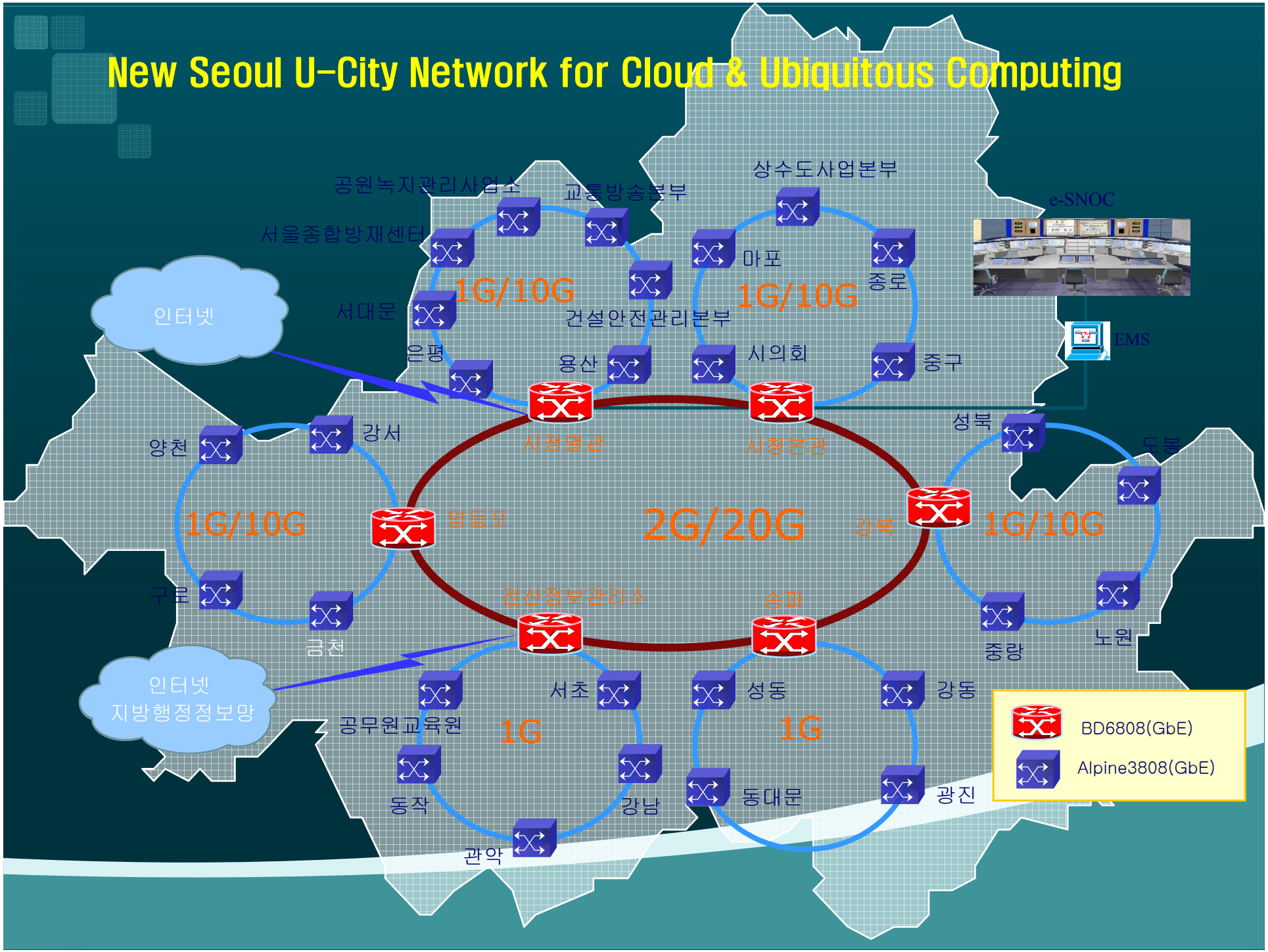
A good test-bed for Cloud computing.

We have been deploying many services based on cloud computing.

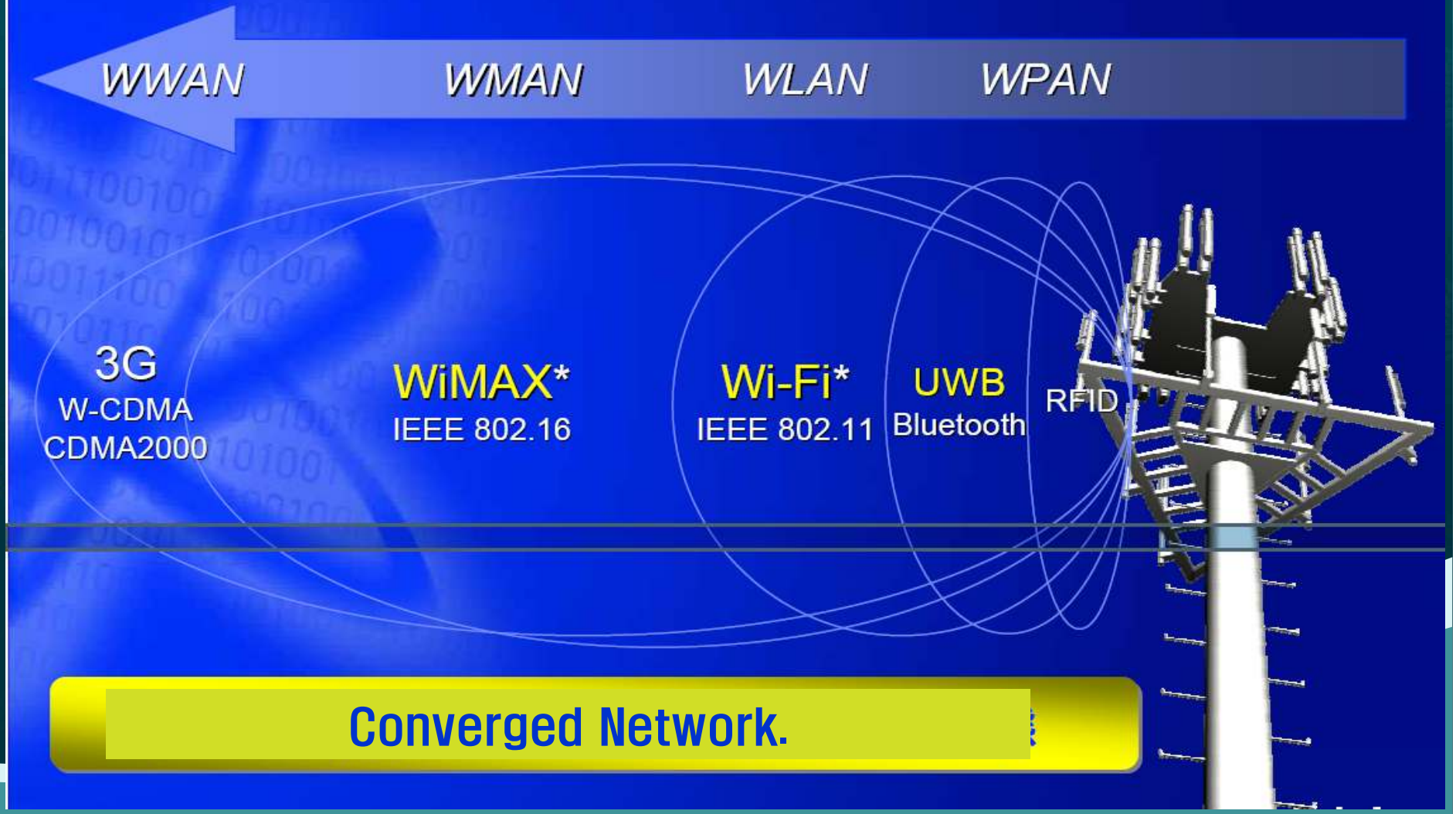
The Concept of U-City

Cloud & Ubiquitous Computing in Seoul

- Green IT to Meet Energy and Resources Savings for Society Services
  - Many computer centers throughout Seoul Metropolitan area.
    => Will be abolished.
    => A new IT Complex is built & operated for Cloud & Ubiquitous Computing.
  - It will save energy and resources and make Seoul a Green IT City.


New Seoul U-City Network for Cloud & Ubiquitous Computing
공원녹지관리사업소
교통방송본부
서울종합방재센터
상수도사업본부
e-SNOC
마포
종로
1G/10G
1G/10G
서대문
건설안전관리본부
인터넷
EMS
은평
용산
시의회
중구
시청별관
시청본관
양천
강서
성북
도봉
1G/10G
영등포
2G/20G
강북
1G/10G
구로
선산정보관리소
송파
금천
중랑
노원
인터넷
지방행정정보망
서초
성동
강동
공무원교육원
1G
1G
동작
강남
동대문
광진
관악
BD6808(GbE)
Alpine3808(GbE)

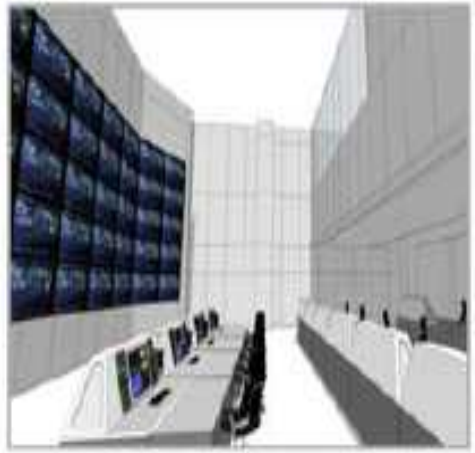
New Seoul U-City Network



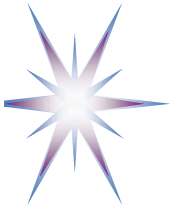
Converged Network.


서울시 IT 콤플렉스
Seoul IT Complex
to manage Cloud & Ubiquitous Computing
세계도시 서울의 IT 미

Seoul IT Complex
to manage Cloud & Ubiquitous Computing



Thank You!



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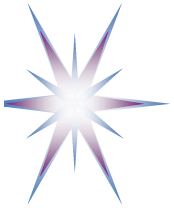
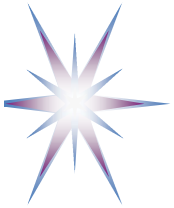


Introduction



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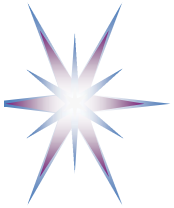

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- Sustainability requires Green-IT in all kinds of resources, compute, network, storage, sensor, …
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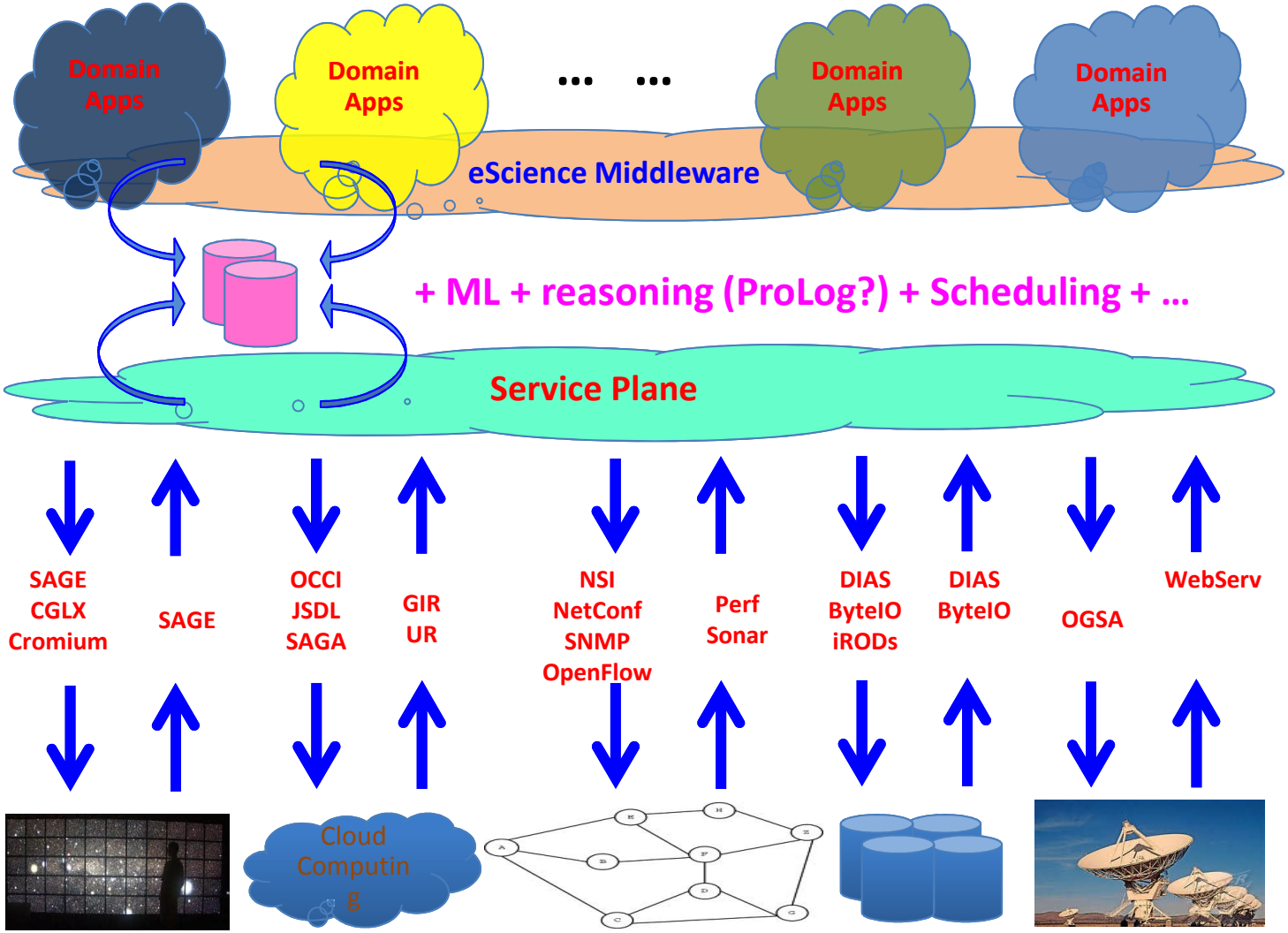


Are Community-Clouds Sustainable?

Steven Greenspan

SERVICE COMPUTATION 2012 July 2012

Data Center Demand For Electricity Is Growing Rapidly

- Approx. $450bn US dollars spent annually on new data center space (1)
- Estimated electricity demand of data centers: 31GW globally (2)
  - Increase of 19% in 2012 from 2011
- Global mobile data traffic grew by 133% in 2011 (3)
  - 597 petabytes of data sent by mobiles every month

1. Intel CEO Paul Ontellini, Speaking at Dell World (October 2011); http://www.informationweek.com/news/hardware/virtual/231901454
2. http://www.datacenterdynamics.com/research/marketgrowth-2011-2012
3. http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html

Date Center Report Card

Company	Clean Energy Index	Coal	Nuclear	Energy Transparency	Infrastructure Siting	Energy Efficiency & GHG Mitigation	Renewables & Advocacy
Akamai	NA	NA		A	C	B	D
amazon.com	12.5%	33.9%	29.9%	F	F	D	F
	15.3%	55.1%	27.8%	D	F	D	D
DELL	56.3%	20.1%	6.4%	C	C	C	D
facebook	36.4%	39.4%	13.2%	D	B	B	C
Google	39.4%	28.7%	15.3%	B	C	B	A

Source: Greenpeace, April 2012, How Clean is Your Cloud?, p. 7. https://docs.google.com/a/greenpeace.org/viewer?url=http://www.greenpeace.org/international/Global/international/publications/climate/2012/iCoal/Facilities%2520Table.pdf

Date Center Report Card (continued)

IBM	12.1%	49.5%	11.5%	C	D	C	D
Microsoft	13.9%	39.3%	26%	C	D	C	C
ORACLE	7.1%	48.7%	17.2%	D	D	C	D
rackspace HOSTING	23.6%	31.6%	22.3%	C	C	C	C
Salesforce	4%	33.9%	31%	B	C	C	C
twitter	21.3%	35.6%	12.8%	F	D	F	D
YAHOO!	56.4%	20.3%	14.6%	C	B	B	B

(a) **Clean Energy Index and Coal Intensity** are calculated based on estimates of power demand for evaluated facilities [http://www.greenpeace.org/cloudcomputingfacilities]
(b) **Akamai**'s global network of server is highly distributed and not possible to individually evaluate as we have done for other brands. However, Akamai is the only company that is reporting a fleet wide and regional Carbon Utilization Effectiveness (CUE), as noted in the data center facility table.
(c) Both **AWS** and **Apple** were provided facility power demand estimates to review, both responded they were not correct, but neither provided alternative estimates. Using conservative calculations, Greenpeace has used best information available to derive power demand, and has decided to publish and invite AWS and Apple to be transparent and provide more accurate data for their facility power demands.

Source: Greenpeace, April 2012, How Clean is Your Cloud?, p. 7. https://docs.google.com/a/greenpeace.org/viewer?url=http://www.greenpeace.org/international/Global/international/publications/climate/2012/iCoal/Facilities%2520Table.pdf

Cloud Computing:
Some Pros and Cons

Benefits of Cloud Computing

- Virtualization & Resource Pooling
  - Large centralized utility model
  - High utilization & efficiency
  - Redundancy & load balancing
- Workload optimization

Reducing energy footprint

- Decrease air conditioning
- Locate where energy is cheap
- Shift workloads
- Avoid over building

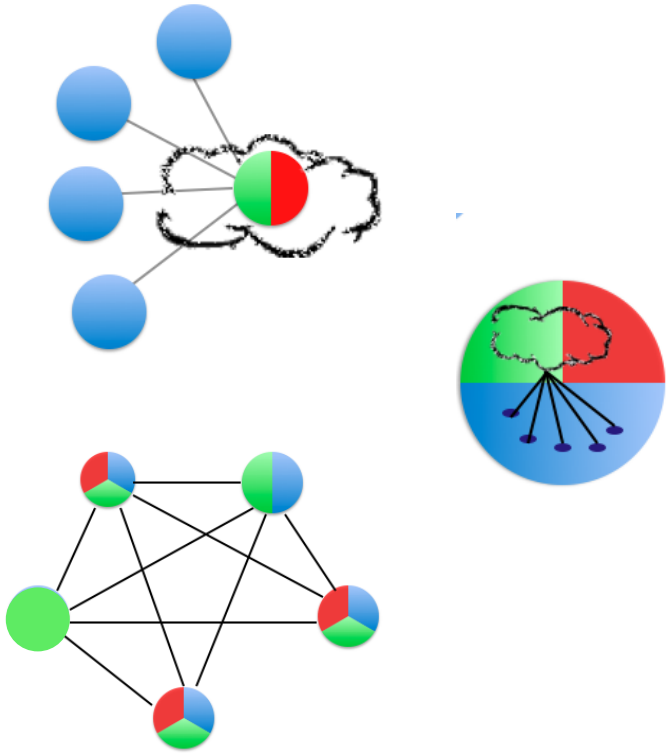
Sustainability Issues

- Possibility of large scale, systemic outages
  - Amazon (C3) outage
  - Vendor lock-in
- Constraints on growth
- PUE ≠ Carbon Footprint

Are Community Clouds sustainable

Sustainability Benefits

- May improve resource planning
  - Members are both providers and consumers
  - Policies and operational decisions reflect membership
- Heterogeneous infrastructure
- Balanced approach to usage
  - Similar to smart grid approach, where consumers regulate usage during peak load



Resource coordination
Resource provision
Resource consumption

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Community-Commerce Brokering Arena for Opportunistic Cloud

Steven Greenspan & Ethan Hadar

SERVICE COMPUTATION 2012 July 2012

Who are we?

- CA Technologies is an IT management software and solutions company
  - Our products enable customers to **manage** and **secure** IT environments and deliver **more flexible IT services**.
  - Mainframe, Distributed Enterprise, and Cloud solutions
- Dr. Ethan Hadar – Distinguished Engineer & SVP Corporate Technical Strategy
  - Distinguished Engineer and Senior Vice President, Corporate Technical Strategy, as well as for leading CA Technologies Israel Research & Development
  - Ph.D. from the Department if System Analysis and Operations Research at the Technion, and an M.Sc. and B.Sc. in Mechatronics
- Dr. Steve Greenspan
  - Senior Vice President and a Research Staff Member in CA Labs
  - Chair of Industry Advisory Board for the Center for Dynamic Data Analytics
  - Co-inventor on over 20 US awarded patents
  - PhD in Cognitive Psychology

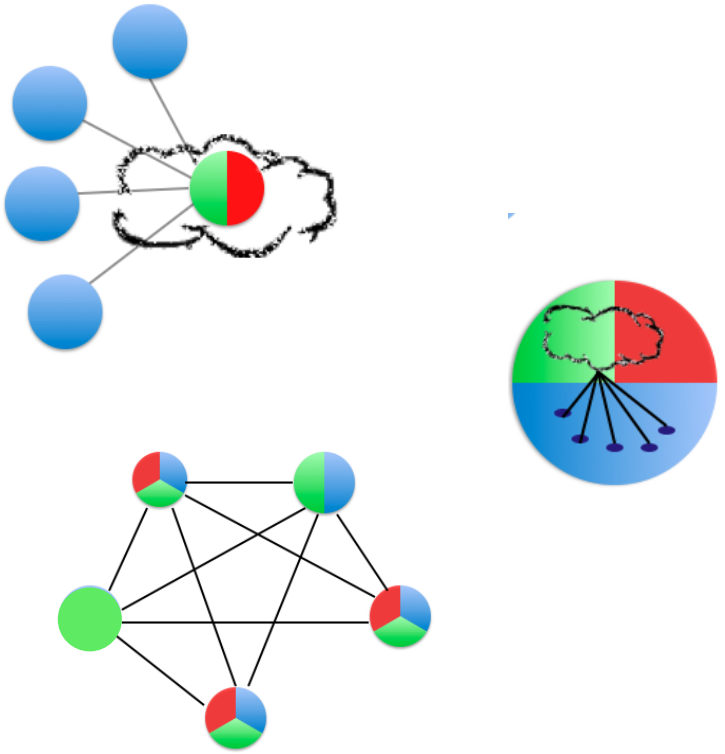
ca technologies

Overview of Talk

- Introduction
  - Delivery Models & Service-Oriented Business Ecosystems
  - Community Clouds
- Community-Commerce Brokers
- Conceptual Architecture
  - Broker
  - Provider Side
  - Requestor (Consumer Side)
- Discussion

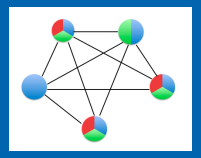
Introduction:
Delivery Models & Service-Oriented Business Ecosystems

- Public Cloud
  - Single provider; multiple consumers
- Private Cloud
  - Single provider; single consumer
- Community Cloud
  - Multiple providers; multiple consumers
- Hybrid Cloud
  - Cloud-bursting is the typical scenario
- Each delivery model requires a customized resource coordination and brokering model



Resource coordination
Resource provision
Resource consumption

Introduction:
Community Clouds - examples



- Government
- Financial
- Open Innovation R&D
  - Pharmaceutical: hospitals, universities, manufacturers
- Supply Chain
  - R&D, manufacturing, distribution

Wall Street Technology

NYSE Technologies Launches Capital Markets Cloud Community Platform

By Greg MacSweeney (mailto:gmacsweeney@techweb.com)
June 01, 2011
URL: (http://wallstreetandtech.com/articles/229700272)

Related Photo Gallery: Inside NYSE's New Data Center (http://www.wallstreetandtech.com/exchanges/NYSE-Datacenter/?image=01_IMG_9614/)

It's no secret that capital markets firms have slow to adopt public cloud technology offerings because of concerns over reliability, security of data and pote
however, an industry-specific cloud offering from NYSE Technologies (http://www.nyse.com/technologies/1207087035761.html) , the commercial technolog
might address some of these concerns.

NYSE Technologies, in partnership with EMC and VMware, has launched the first capital markets industry-specific cloud platform, dubbed the Capital M
provide rapid provisioning of processing power, access to historical market data and temporary compute capacity for real-time testing, said Stanley Young
enterprise-level platform was developed to address the unique performance and security requirements of financial services firms, according to NYSE Tech

Currently, two customers, Pico Quantitative Trading, an an agency-only broker that provides services to multi-asset electronic trading clients, and Millenn
$10.62 billion in assets under management, are utilizing the cloud community platform. Jarrod Yuster, cofounder and CEO of Pico, says his firm is leverag
testing of quantitative trading strategies. The platform will go live for other customers on July 1.

NYSE Euronext brings community cloud services to Europe

By Ambrose McNevin
Created 05/17/2012 - 13:48

NYSE Euronext brings community cloud services to Europe

Financial services firms offered full service range from Basildon data center

17 May 2012 by Ambrose McNevin - DatacenterDynamics

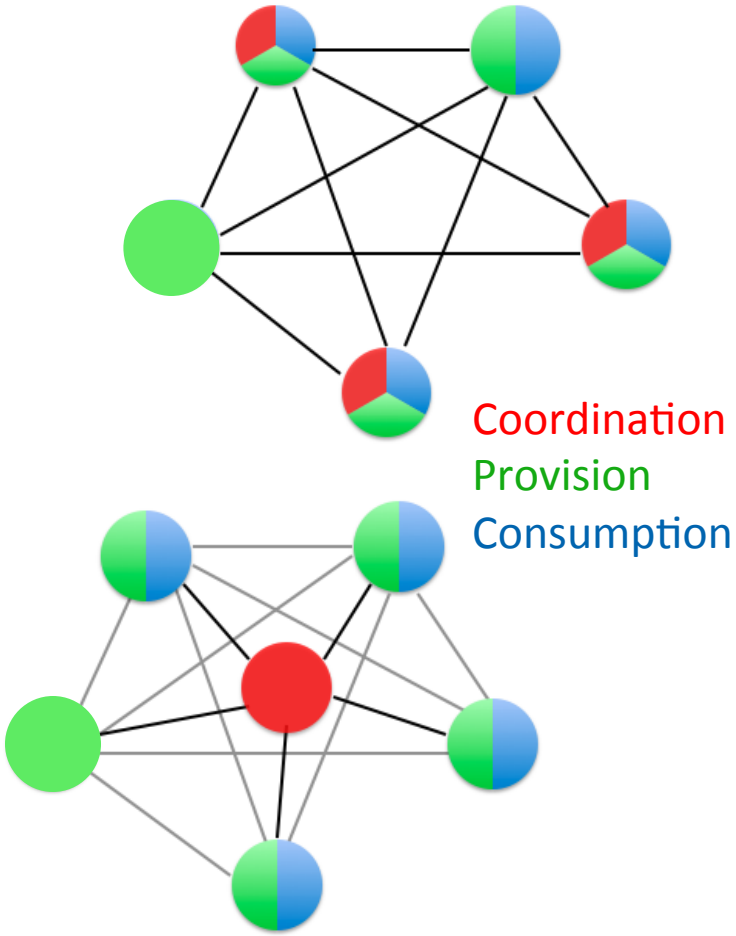
Print

Community Cloud: the full technology stack from infrastructure to analytics

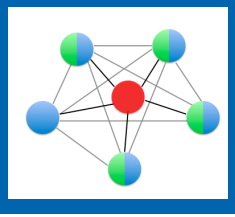
NYSE Technologies launched its Capital Markets Community Platform into Europe based at its gigantic Basildon data center east of L
The technology division of the NYSE Euronext stock exchange operator worked with EMC and Vmware saying the cloud based platfo
The move into Europe follows the US launch of the service last year which served Wall Street clients from its Mahwah data center in N
Ken Barnes, Global Head of Platform Services, NYSE Euronext said operating the complex technology stack from infrastructure to an

Community Cloud:
It's still evolving

- Many providers and many consumers within a single community
  - Exclusive use by a specific community of consumers who are also providers
  - May exist per-project, within a community
  - Shared concerns (e.g., mission, policies)
  - Resource sharing
  - Services may be available opportunistically
- Coordination & QOS may be brokered by a single organization or distributed across organizations



Community-Commerce Brokers



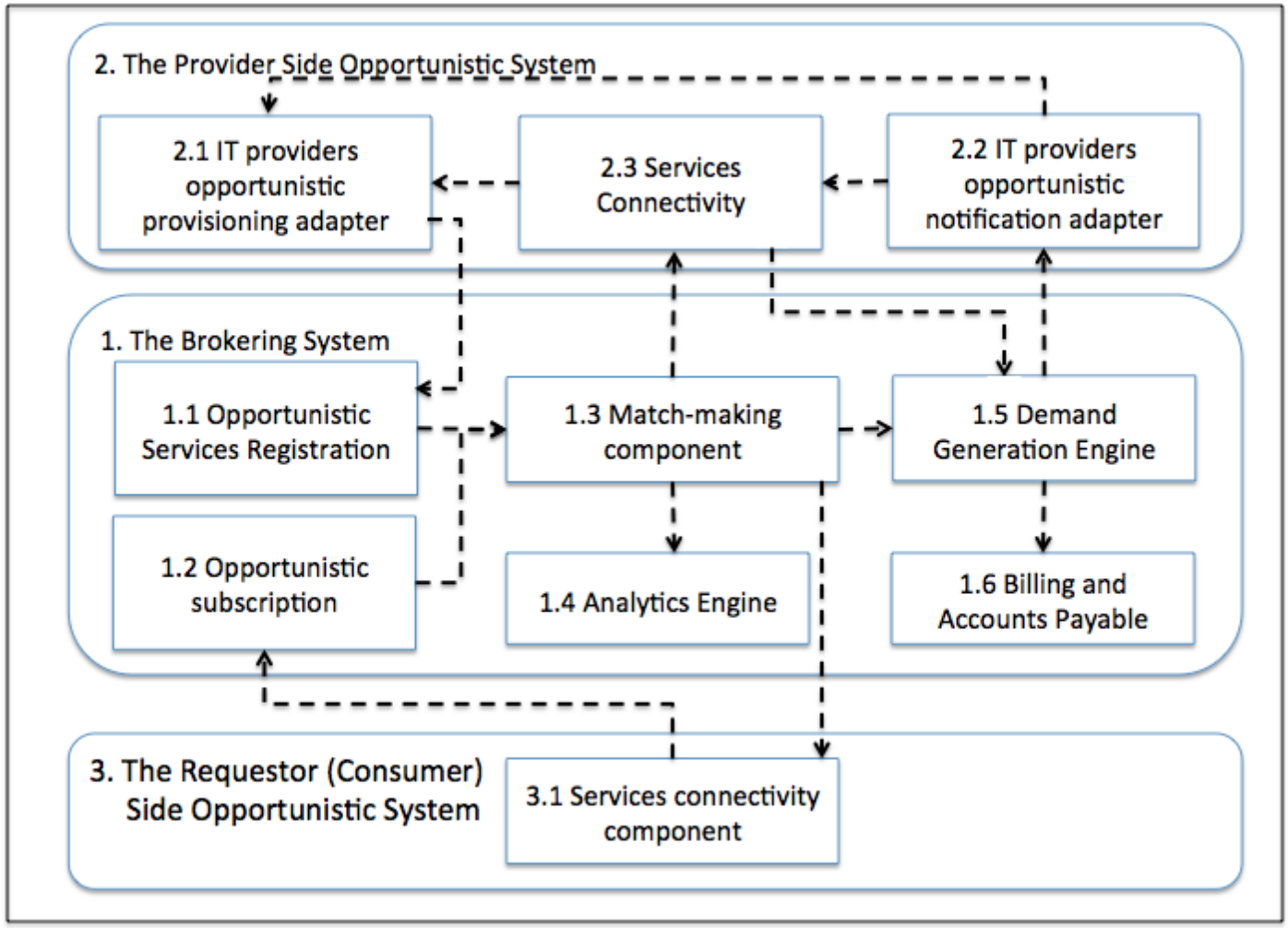
- Provide information on available services
- Coordinate, Monitor and Manage
- Supply “core” services, e.g.,
  - Service orchestration tools
  - QOS Reports
- Facilitate negotiations among members & external vendors
- Record who provides resources and services, and who consumes
  - Companies may expect compensation for services delivered

Conceptual Architecture
Community-Commerce Brokering Arena for Opportunistic Cloud

Provider Side

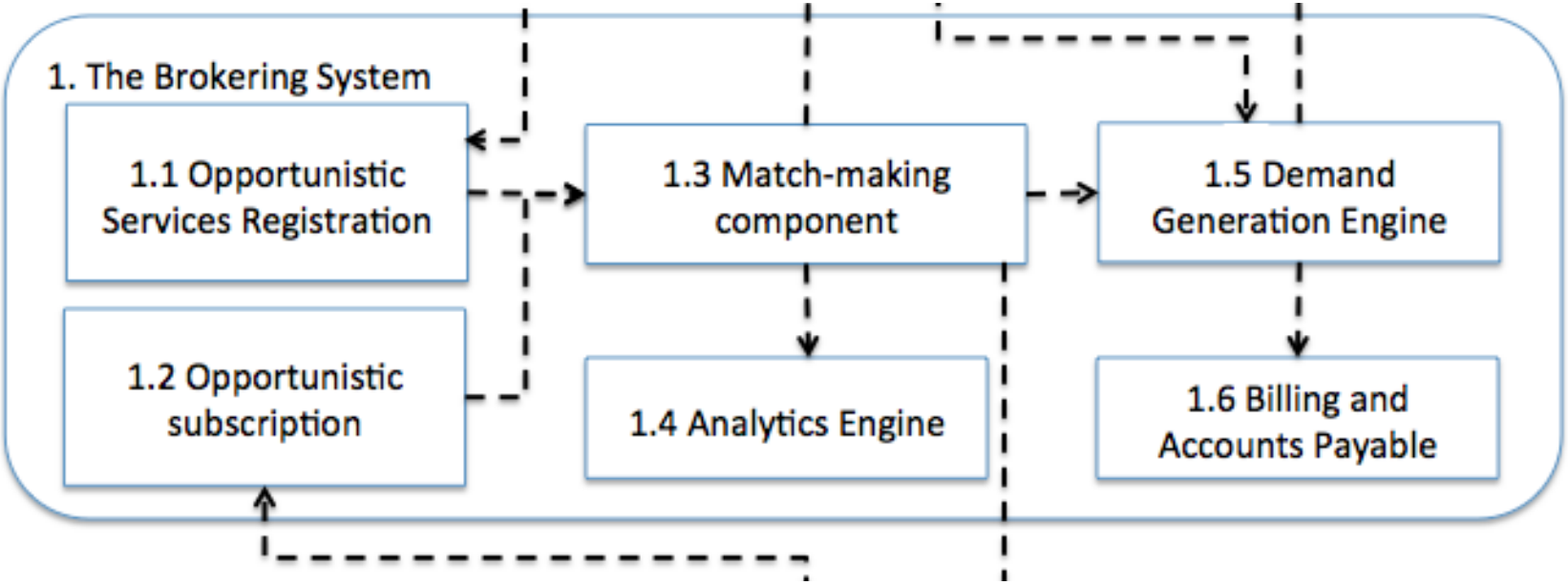
Brokering System

Requestor (Consumer) Side



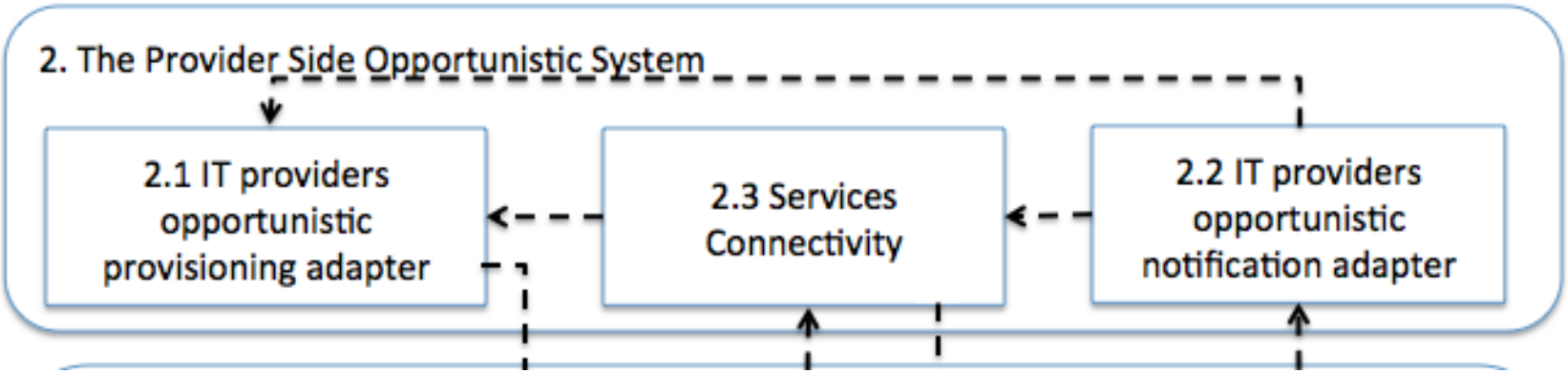
ca technologies

Conceptual Architecture:
Brokering System



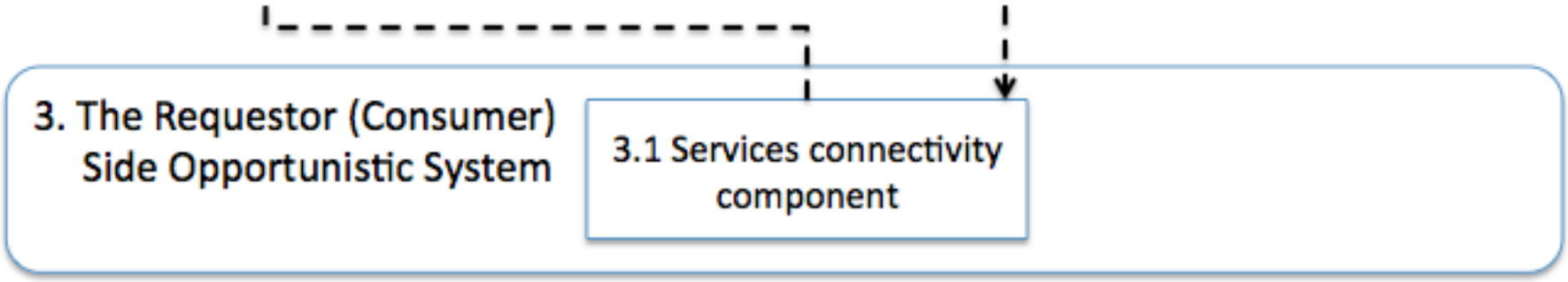
- Role of Brokering System
  - Conducts matchmaking between potential service providers and requestors, and facilitates the negotiations between the two sides.
  - Identifies gaps between needs and available services
  - Manages rewards vs. costs

Conceptual Architecture:
Provider Side



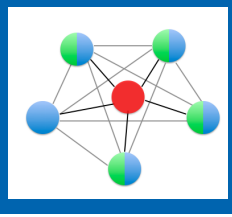
- Role of Provider Side
  - Enables the IT provider to publish the potential services offerings
  - Publishes the opportunistic availability of the service

Conceptual Architecture:
Requestor (Consumer) Side



- Role of Requestor Side
  - System enables the requestor of services to subscribe to services registered in the brokering system.
    - The requestors can define criteria for the services

Benefits



- Maximize capacity utilization
- Promote “fair” sharing of resources
- Negotiate with external IT service providers and consumers
  - Promote revenue generation
- Detect new business opportunities

Open Discussion

Thank you for your questions and attendance

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Cloud Computing in the Ubiquitous City to Meet Energy and Resources Savings for Society Services

Presented by Yong Woo LEE, Ph.D.
The President of Ubiquitous City Consortium
Director of Seoul Grid Center
Professor, Univ. of Seoul, Korea
Chair, Korea National Standard Committee for ISO JTC1/ SC22
Vice President, Korea Internet Information Society

For the Cloud Computing 2012 Panel Discussion

2012. 7. 25

Ubiquitous City

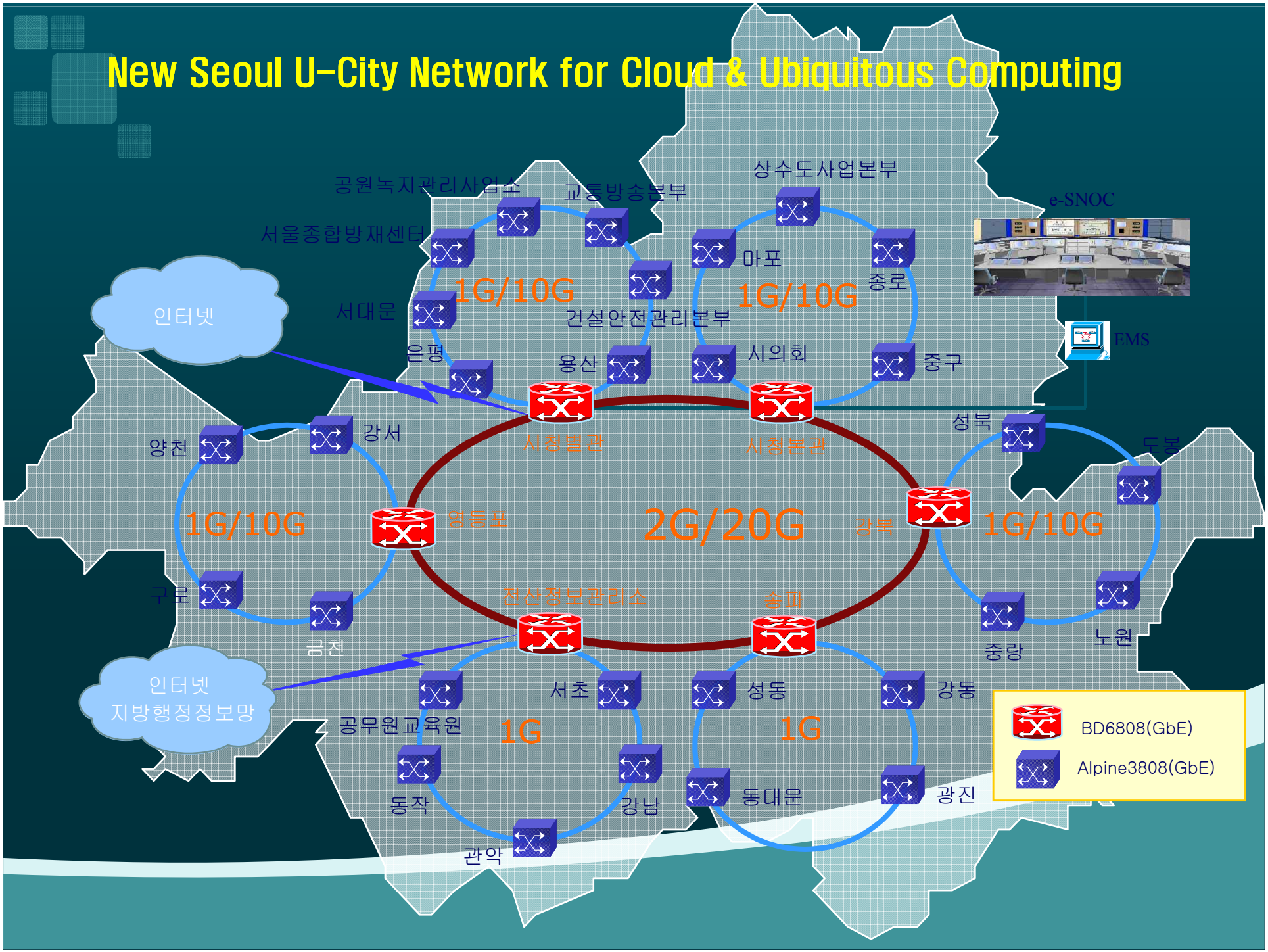
A good test-bed for Cloud computing.

We have been deploying many services based on cloud computing.

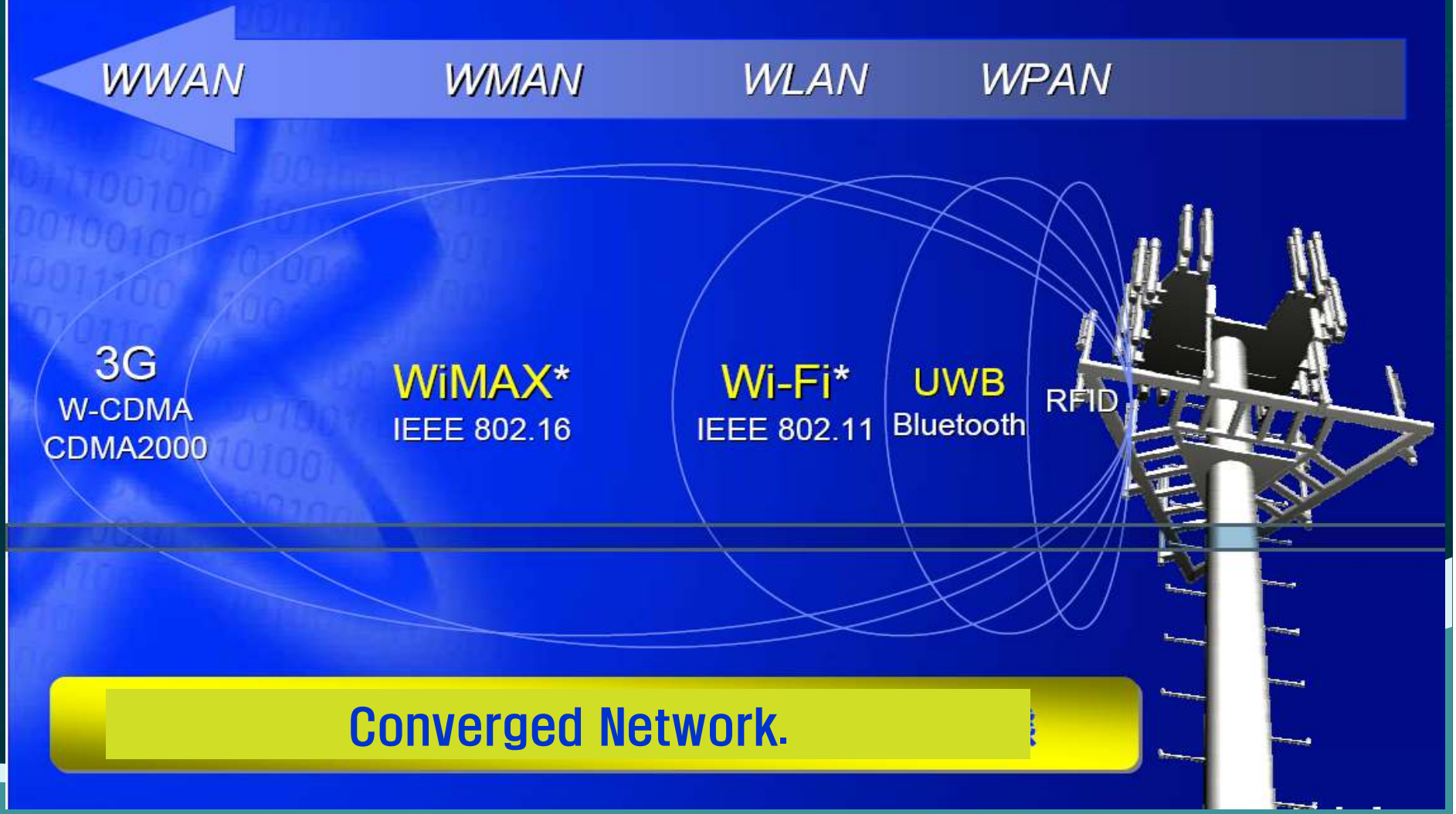
The Concept of U-City

Cloud & Ubiquitous Computing in Seoul

- Green IT to Meet Energy and Resources Savings for Society Services
  - Many computer centers throughout Seoul Metropolitan area.
    => Will be abolished.
    => A new IT Complex is built & operated for Cloud & Ubiquitous Computing.
  - It will save energy and resources and make Seoul a Green IT City.


New Seoul U-City Network for Cloud & Ubiquitous Computing
공원녹지관리사업소
교통방송본부
서울종합방재센터
상수도사업본부
e-SNOC
마포
종로
1G/10G
1G/10G
서대문
건설안전관리본부
인터넷
EMS
은평
용산
시의회
중구
시청별관
시청본관
양천
강서
성북
도봉
1G/10G
영등포
2G/20G
강북
1G/10G
구로
선산정보관리소
송파
금천
중랑
노원
인터넷
지방행정정보망
서초
성동
강동
공무원교육원
1G
1G
동작
강남
동대문
광진
관악
BD6808(GbE)
Alpine3808(GbE)

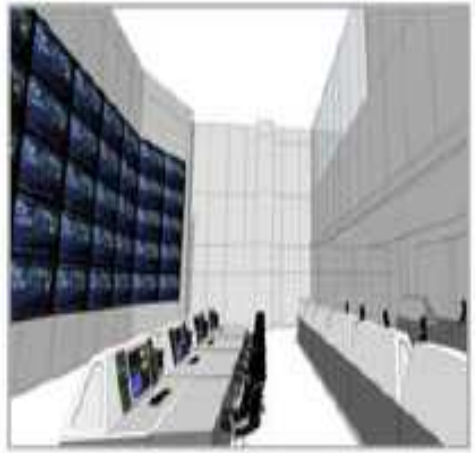
New Seoul U-City Network



Converged Network.


서울시 IT 콤플렉스
Seoul IT Complex
to manage Cloud & Ubiquitous Computing
세계도시 서울의 IT 미

Seoul IT Complex
to manage Cloud & Ubiquitous Computing



Thank You!