CERN openlab / SDN

The ViSION Project

CERN openlab – HP Networking

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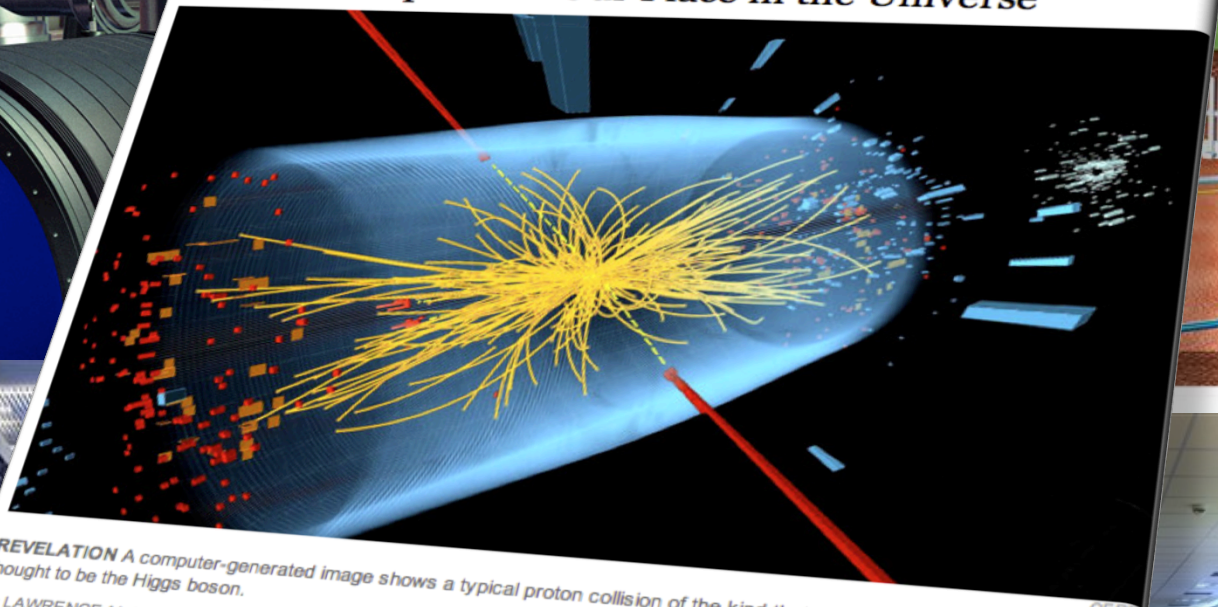
ENVIRONMENT | SPACE & COSMOS

ESSAY

A Blip That Speaks of Our Place in the Universe



REVELATION A computer-generated image shows a typical proton collision of the kind that produced evidence of a particle thought to be the Higgs boson. CERN

By LAWRENCE M. KRAUSS
Published: July 9, 2012

ASPEN, Colo. — Last week, physicists around the world were glued to computers at very odd hours (I was at a 1 a.m. physics "party" here with a large projection screen and dozens of colleagues) to watch live as scientists at the Large Hadron Collider, outside Geneva, announced that they had apparently found one of the most tant missing pieces of the jigsaw puzzle that is nature.

CERN Mission

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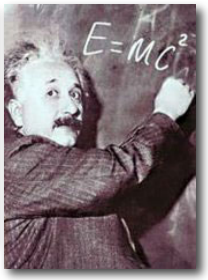
- **Push** the frontiers of knowledge

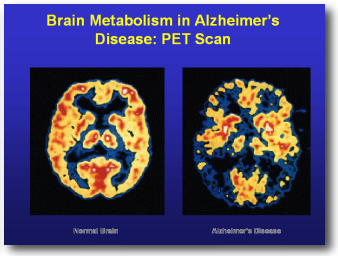
  E.g. the secrets of the Big Bang …what was the matter like within the first moments of the Universe's existence?



- **Develop** new technologies for accelerators and detectors

  Information technology - the Web and the GRID

  Medicine - diagnosis and therapy



- **Train** scientists and engineers of tomorrow

- **Unite** people from different countries and cultures

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The **largest** particle physics laboratory in the world

Annual budget

~ 1.000 MCHF (1.000 MUSD)

External funding for experiments

People

2.424 Staff
783 Fellows & assoc.
288 Students
10.388 Users
2.000 External Firm

Twenty Member States

Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Hungary, Netherlands, Norway, Poland,Portugal, Slovakia, Spain, Sweden, Switzerland, United Kingdom
+ Romania, Israel and Serbia as candidates

Seven Observer States

European Commission, **USA**, Russian Federation, India, Japan, Turkey, UNESCO

Worldwide LHC computing grid

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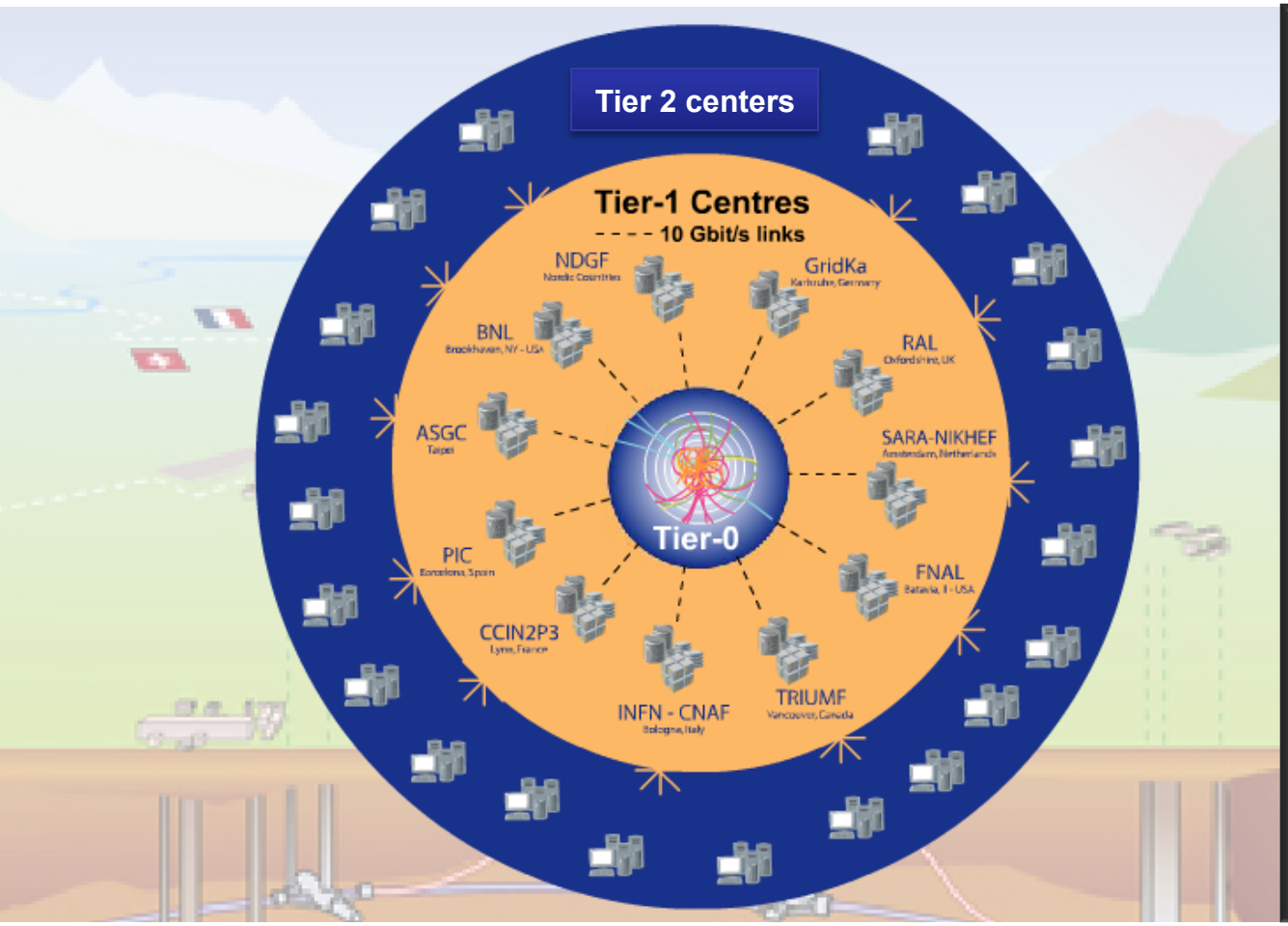

Tier-0 (CERN):
- Data recording
- Initial data reconstruction
- Data distribution

Tier-1 (11 centers):
- Permanent storage
- Re-processing
- Analysis

Tier-2 (>200 centers):
- Simulation
- End-user analysis

CERN backbone infrastructure

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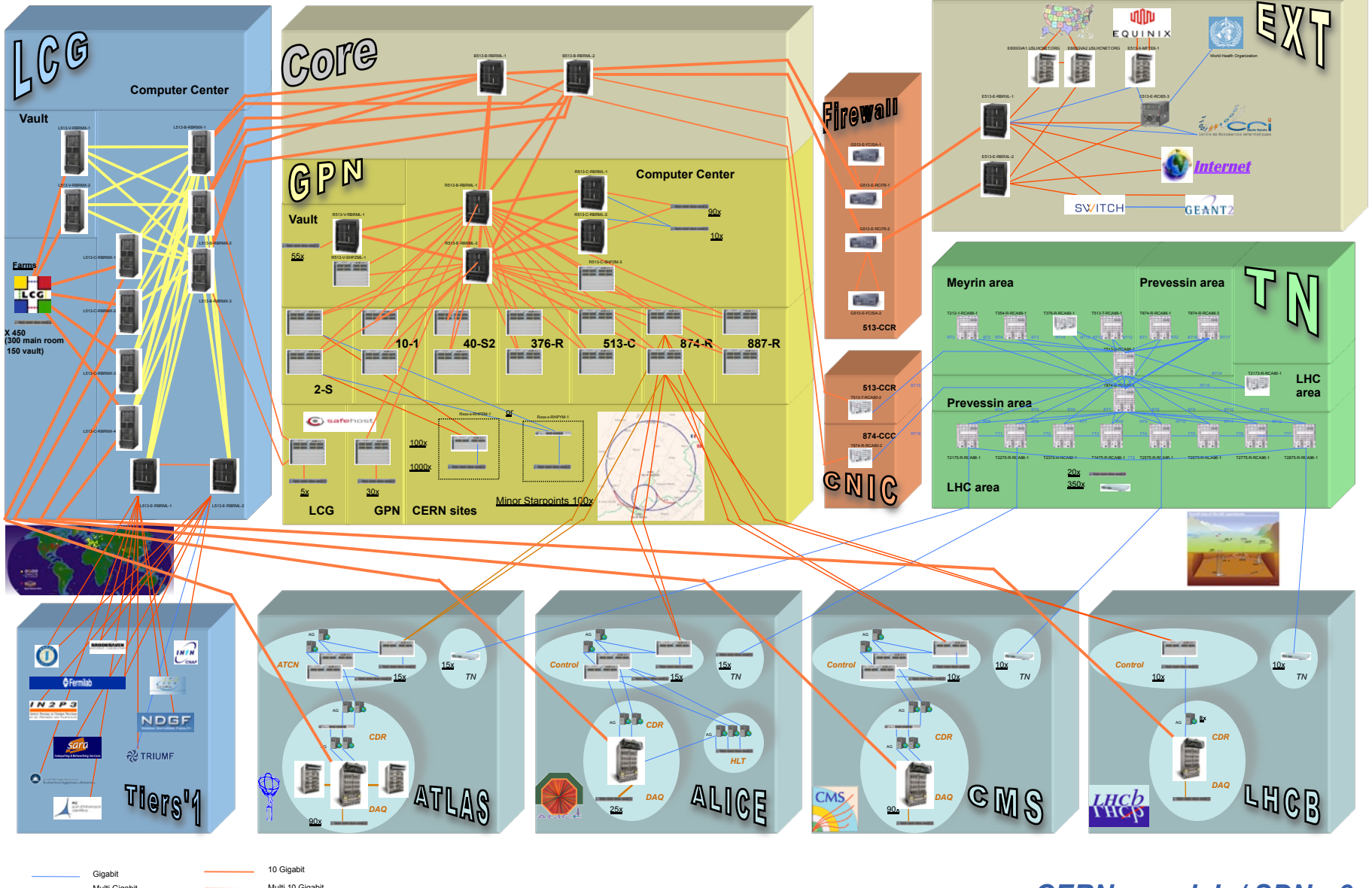

CERN Computing Environment

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- Dynamic
  - Constantly evolving and expanding
  - Rapidly changing user requirements
  - Distributed systems, VM services
- Heterogeneous
  - Several independent networks (7+)
  - Different requirements
  - Diverse user groups
- High traffic
  - Constant high input from accelerator detectors
  - Real-time online filtering and offline grid processing
- 24/7 Service Availability
  - Operational maintenance flexibility
  - Scalability and load balancing
  - Almost no maintenance windows

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CERN openlab in a nutshell

- A science – industry partnership to drive R&D and innovation
- Started in 2002, now in 10th year
- Evaluate state-of-the-art technologies in a challenging environment and improve them
- Test in a research environment today what will be used in industry tomorrow
- Training, Dissemination and Outreach
- www.cern.ch/openlab

CERN's interest in SDN

- SDN/ Openflow technology evaluation
  - Started 2012
  - Openlab project with HP Networking (ViSION)
  - Potential benefits for the communication infrastructure
- Interest in SDN for enhancing:
  - Service scalability
  - Load balancing
  - VM mobility
  - Inter-center communication

The ViSION Project

- CERN openlab - HP Networking collaboration
  - Traffic orchestration using SDN
  - Started in February 2012
- Prototype development
  - SDN technology from HP
  - HP Openflow enabled switches
- Goals
  - Scale out network resources
  - Product to be deployed at CERN

The ViSION Project

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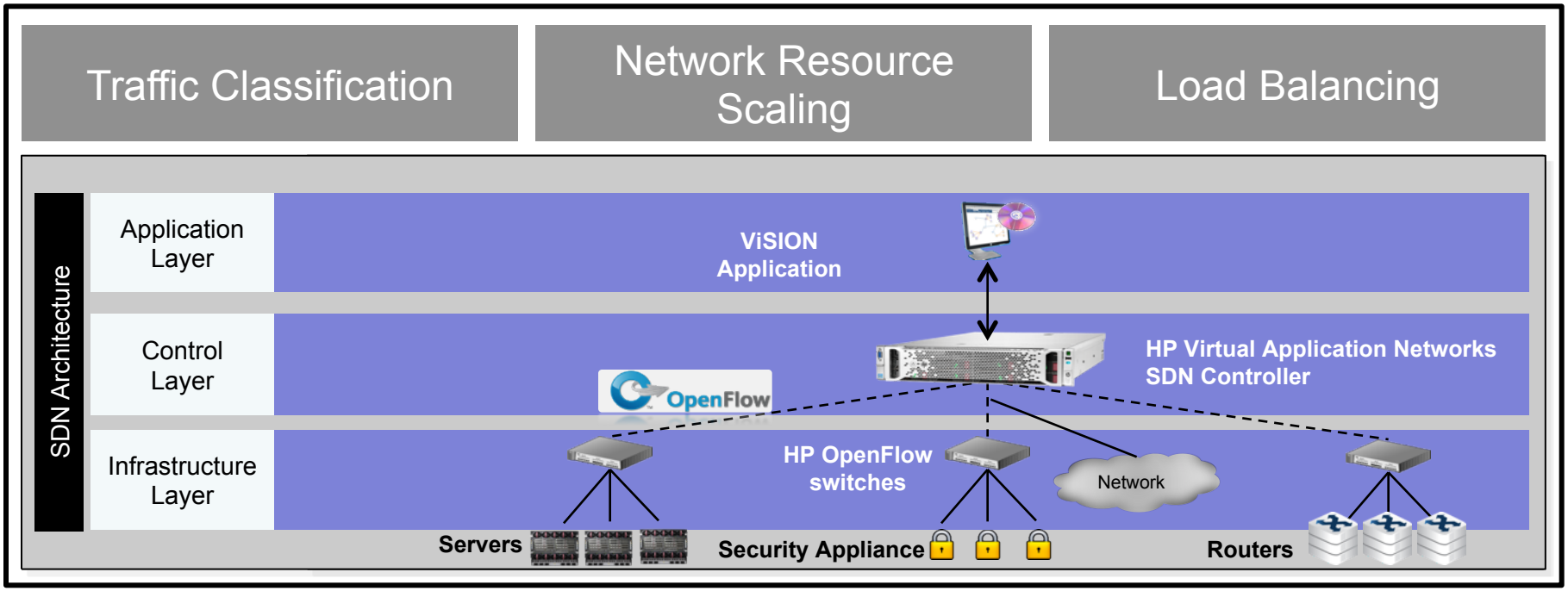


Extends scalability

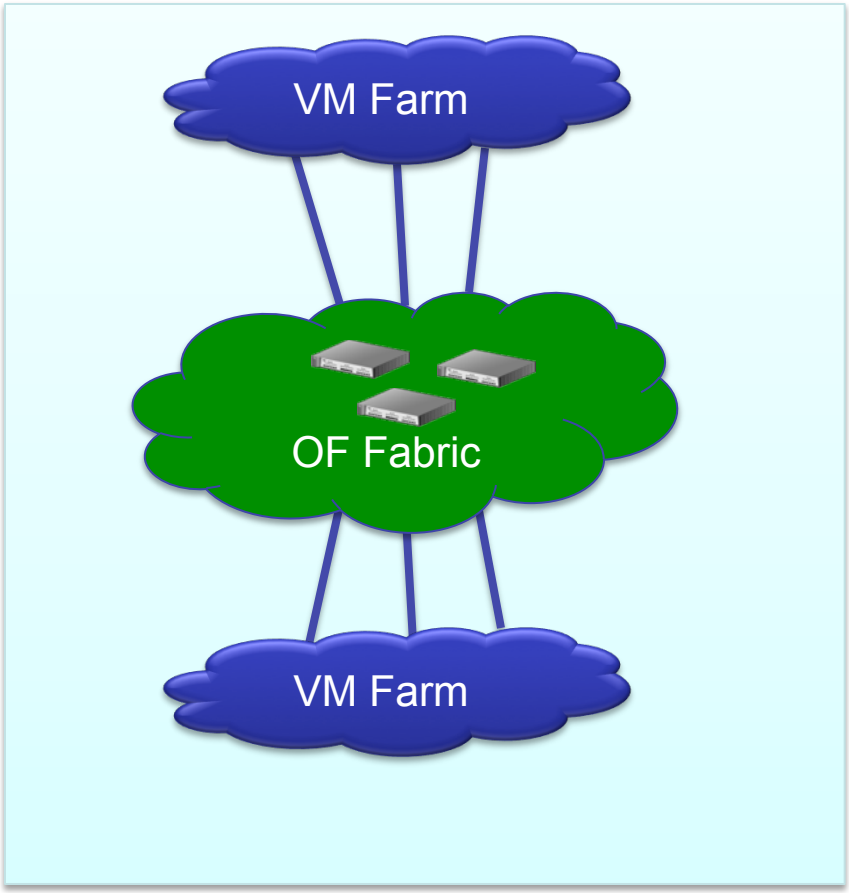
Improved resource utilization

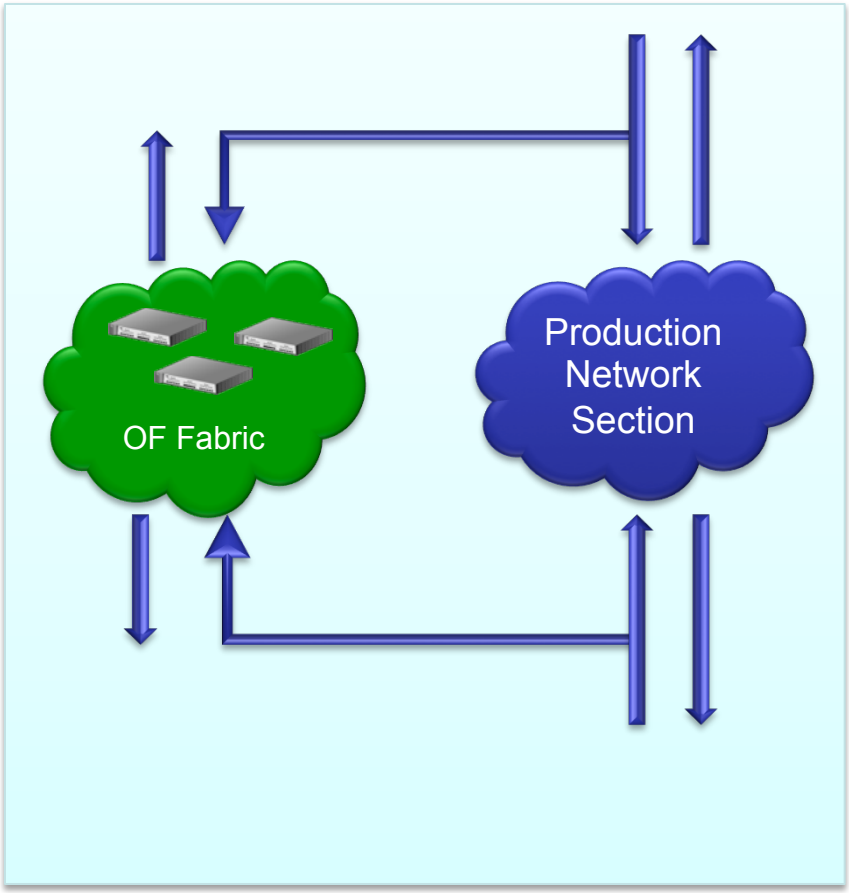
Standards-based using OpenFlow

- Working directly with the CERN network team on requirements and design
- ViSION research team developing the network resource scaling application

Lab Testing Plans

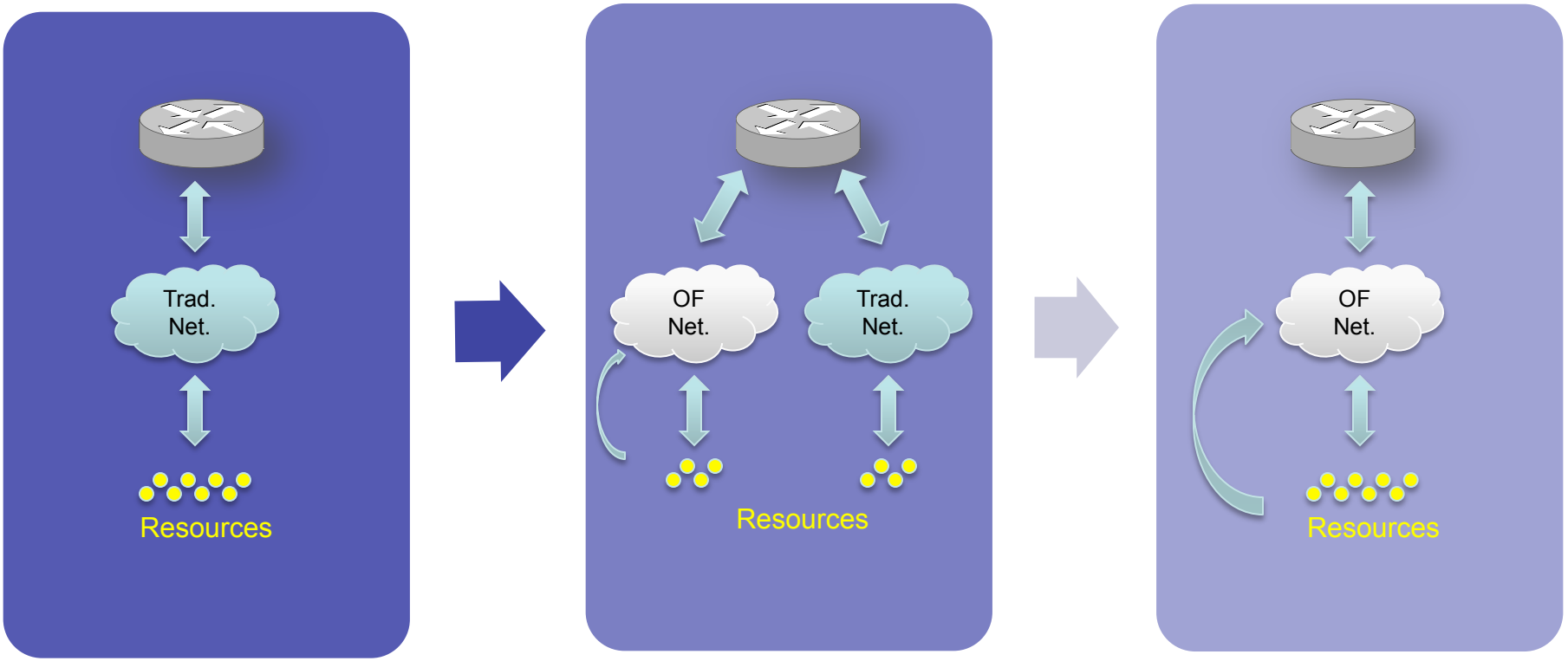
- Regression testing
  - Deterministic traffic injection
  - End to end quality metrics
- Mirrored testing
  - Test OF setup with real traffic
  - Flow pattern analysis



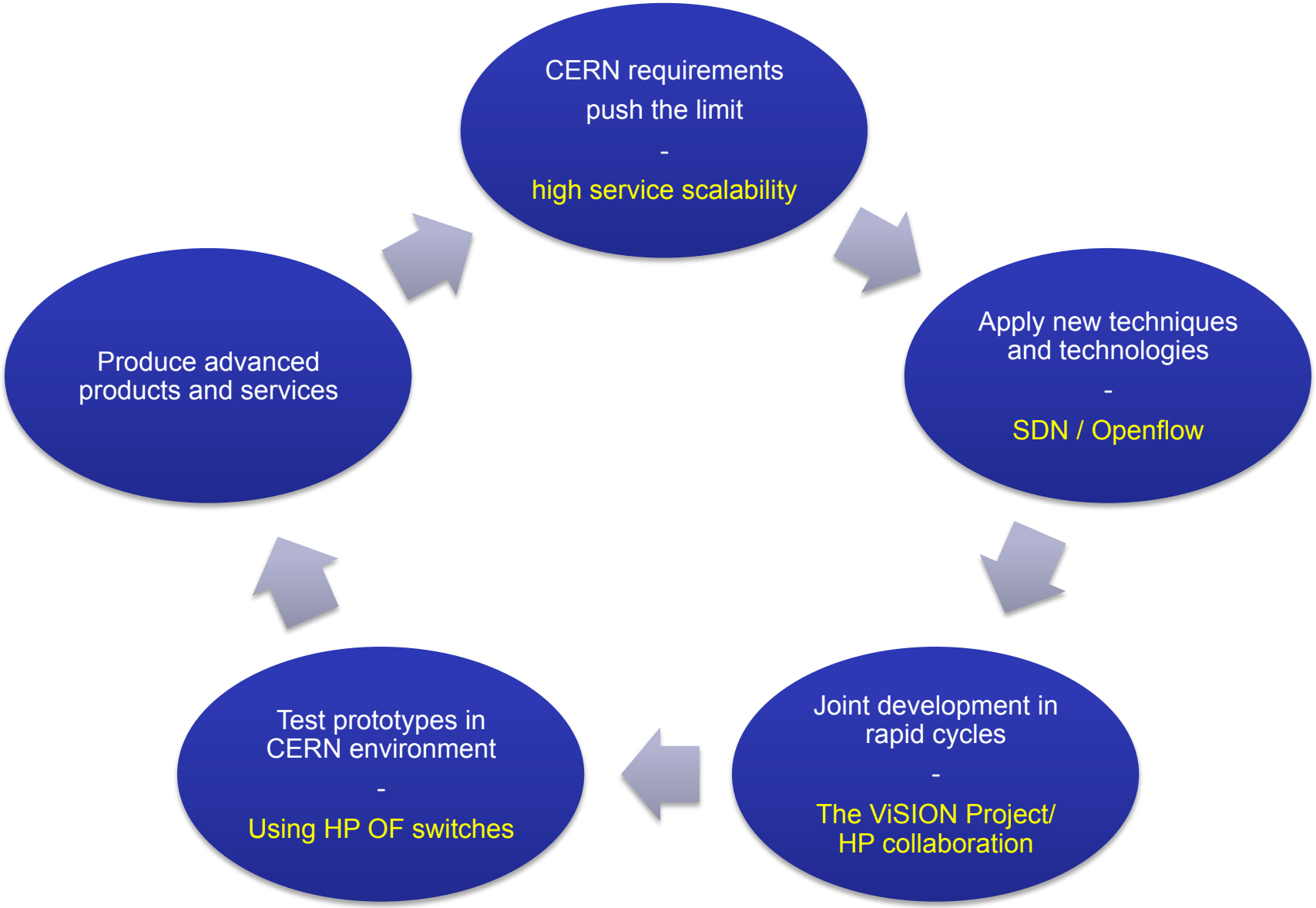


Deployment Plans

- Gradual service migration
  1. Migrate non-critical resources/ sections
  2. Validation and performance fine-tuning
  3. Full migration to OpenFlow



Conclusions



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