Projects and Test Beds Related to OBS in Europe

Christoph Gauger
Institute of Communication Networks and Computer Engineering
University of Stuttgart
gauger@ikr.uni-stuttgart.de

2nd Int’l Workshop on Optical Burst Switching
Globecom 2003, San Francisco – December 6, 2003
What defines OBS – especially vs. OPS?
• Assembly of client packets to form larger units
• One-pass reservation/tell-and-go
• No buffers in the network
• Offset-time
• Burst-mode transmission
• ...

For this presentation
… at least one of the criteria to be satisfied

Disclaimer
• Project overviews to the best of my knowledge
• No projects left out intentionally, more projects likely to exist
Institute of Communication Networks and Computer Engineering
University of Stuttgart

NOBEL

- Integrated Project (IP) in 6th EU framework
- 32 partners from 15 countries
- Ca. 2000 person months in 2004–2005
- Major vendors, carriers and university groups

Key objective

"... to find and to validate experimentally innovative network solutions and technologies for intelligent and flexible optical networks"

OBS/OPS activities

- **Architectures**, concepts and solutions for assuring end-to-end QoS
- Novel **control** and **management** functions required for OBS
- Solutions to burst mode **transmission**, lab experiments
Key objective

"... studying, proposing and validating the use of optical logic gates ... at metro network nodes in all-optical label-swapping (AOLS) networks"

OBS/OPS activities

- **Design and realization** of new optical logic gate architecture for AOLS
- **Demonstration** of an all-optical routing node (read, swap, route)
- **Study of networking aspects** of AOLS: performance, planning, ...
- **Innovative disaster recovery** strategies for OPS networks
• Project in 5th EU framework
• 9 partners from 6 countries
• Ca. 690 person months, 12/2001–11/2004
• University/research centers, manufacturer and carrier

Key objective
"... improve throughput of packet-switched networks by novel optical routing techniques based on stacked optical labels" \[\lambda\text{ and FSK}\]

OBS/OPS activities
• Network and AWG node architectures
• Network management and control for QoS support
• Creation of key optical components
• Lab testbed and small-scale field trial with the AWG node
TransiNet

- German government funded
- 5 partners
- 2000–2003
- University/research, 1 operator

OBS activities
- Architectures and concepts
- QoS and contention resolution strategies
- Tune-and-Select (TAS) node based on SOAs and TWCs
- Integrated evaluation of performance and technology
• WDM burst metro ring
• Testbed by Alcatel Research & Innovation
• Related research projects: IST-DAVID, BMBF MultiTeraNet BurstNet

Key objective
"...access nodes with passive optical design and an aggregation hub for multi-ring interconnection..."

OBS/OPS activities
• Architectures, concepts and solutions for metro networks
• Design and realization of low-cost burst-mode transceivers
• Native Quality of Service support
• Performance monitoring in burst-mode networks
E-Photon ONe

- "Network of Excellence" in 6th EU framework
- 40 partners of 17 countries
- Starting early 2004
- Integration of European research activities in field of optical networks
- Joint research activity includes OBS

COST Actions

- EU/European Science Foundation
- Action COST 266 had working group on OBS/OPS
- 15 signatory countries – 20+ groups
- Final report available at (in future): sirius.ure.cas.cz/dpt240/cost266/
- New action proposed including OBS/OPS activities
OBS Timing

Granularity
- packet
- burst
- dynamic circuit

Burst Assembly
- SOAs
- TWCs

Switching Technology
- edge delay
- core rate approx. 10*access rate

End-to-end Signaling
- nation
- campus
- metro
- world

joint work with H. Buchta, J. Saniter, E. Patzak of HHI Berlin
Future Direction of OBS

...more like OPS

- Typical burst length
  - Short: 10...100 µs, some aggregation
  - One-pass only

- Contention resolution
  - λ conv., FDL, deflection routing

...more like OCS

- Typical burst length
  - Long: > 1 ms, extensive aggregation
  - One-pass or end-to-end

- Contention resolution
  - λ conv., defl./alternative routing

→ Need for consistent solutions: architecture + technology + control
Summary

• **Topics**
  - viability for operators
  - metro/core scenario
  - technologies
  - cost-efficient implementation

• **Considerable effort in**
  - EU projects
  - national projects

➤ *But downturn of industry has shifted focus significantly*
Projects and Test Beds Related to OBS in Europe

Christoph Gauger, gauger@ikr.uni-stuttgart.de

Presentation and Links at
www.ikr.uni-stuttgart.de/~gauger/BurstSwitching.html

Thanks to …
Erik van Breusegem, Walter Cerroni, Gert Eilenberger, Lars Dembeck, Mike O’Mahony, Javier Marti, Jose Martinez, Fabio Neri, Martin Nord, Erwin Patzak
"Information Society Technologies (IST)" in 6th Framework Project of EU

- Cordis IST in FP 6 server: www.cordis.lu/ist/

Thematic Network projects
- OPTIMIST: www.ist-optimist.org
- BREAD: www.ist-bread.org
European Projects Contact

- **NOBEL**
  N.N.
  Telecom Italia, Antonio Manzalini, antonio.manzalini@telecomitalia.it

- **LASAGNE**
  N.N.
  Universidad Politecnica de Valencia/E, Javier Marti, jmarti@dcom.upv.es

- **STOLAS**
  www.ist-stolas.org
  Eindhoven Univ. of Technology/NL, Ton Koonen, a.m.j.koonen@tue.nl

- **DAVID**
  david.com.dtu.dk

- **DBORN in IST-DAVID**
  Alcatel, Amaury Jourdan, amaury.jourdan@alcatel.fr

- **DBORN in BMBF MultiTeraNet BurstNet**
  Alcatel, Alcatel, Gert Eilenberger, gert.eilenberger@alcatel.de

- **E-Photon ONE**
  N.N.
  Politecnico di Torino/I, Fabio Neri, neri@polito.it

- **COST 266**
  sirius.ure.cas.cz/dpt240/cost266/
  Management Committee, Anton Kuchar, kuchar@ure.cas.cz
National Projects

• **Belgium**
  - project at IMEC on OBS

• **France**
  - Rom-eo

• **Germany**
  - BMBF TransiNet  www.transinet.de
  - BMBF MultiTeraNet BurstNet  www.multiteranet.de

• **Italy**
  - Ringo  www.optcom.polito.it

• **UK**

• ...
OBS Timing

Granularity

Burst Assembly

Switching Technology

End-to-end Signaling

joint work with H. Buchta, J. Saniter, E. Patzak of HHI Berlin

assumption: core rate approx. 10*access rate
Future direction of OBS

...more like OPS

- typical burst length
- short: 10...100 $\mu$s, some aggregation
- one-pass only
- $\lambda$ conv., FDL, deflection routing

...more like OCS

- long: $>1$ ms, extensive aggregation
- burst reservation
- one-pass or end-to-end
- contention resolution
- $\lambda$ conv., defl./alternative routing

→ Need for consistent solutions: architecture + technology + control