Jessica A. Gaskin (Study Scientist, MSFC)

On Behalf of the X-Ray Surveyor Community

X-RAY SURVEYOR – THE PATH FORWARD

AAS HEAD 2016, Naples, FL

X-ray Surveyor Goals

Scientifically Compelling

Frontier science from Solar system to first accretion light in Universe; revolution in understanding physics of astronomical systems

-Gather broad Science Community Support
-Maintain steadfast science requirements over Program lifetime

Leaps in Capability

Large area with high angular resolution with orders of magnitude gains in sensitivity, large field of view with subarcsec imaging, high resolution spectroscopy for point-like and extended sources, other?

-Allow for multiple technology paths
-Formulate a strong plan for achieving requirements
-Invest in technology development and proof-of-concept testing

Feasible

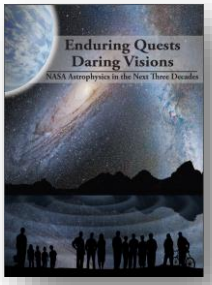
Chandra-like mission for cost and complexity

-Embrace Chandra Heritage and lessons learned
-Utilize previous studies when possible (IXO, Con-X, AXSIO, etc…)

Consistent with:

NASA Astrophysics Roadmap:

Enduring Quests, Daring Visions



http://science.nasa.gov/media/medialibrary/2013/12/20/secure-Astrophysics_Roadmap_2013.pdf

Scientifically Compelling - Roadmap

How Did We Get Here?

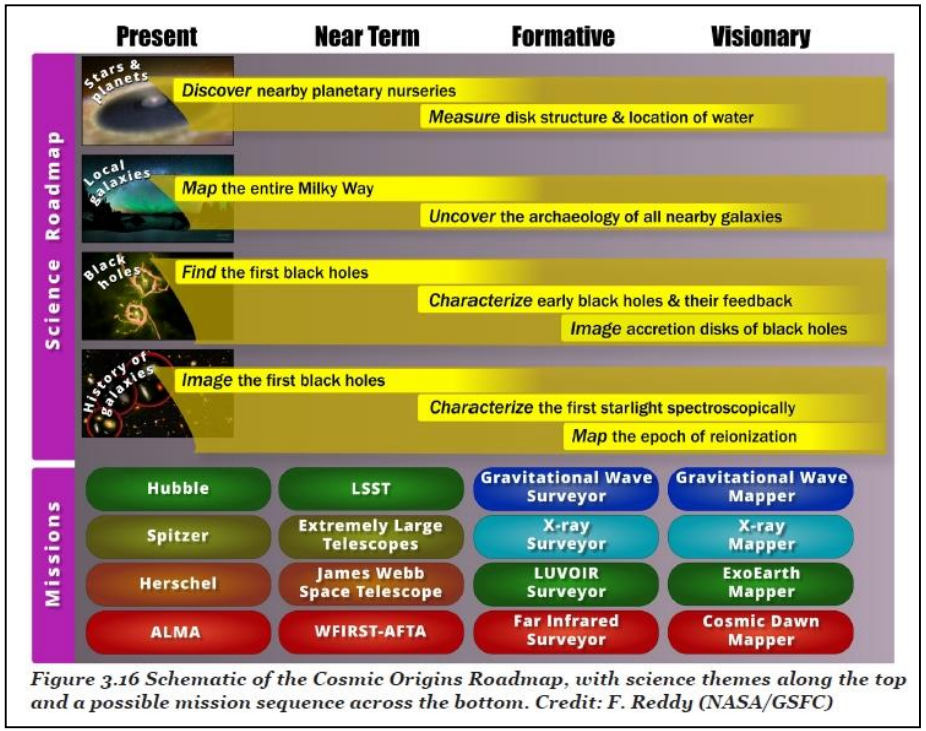


Figure 3.16 Schematic of the Cosmic Origins Roadmap, with science themes along the top and a possible mission sequence across the bottom. Credit: F. Reddy (NASA/GSFC)

How Does The Universe Work?

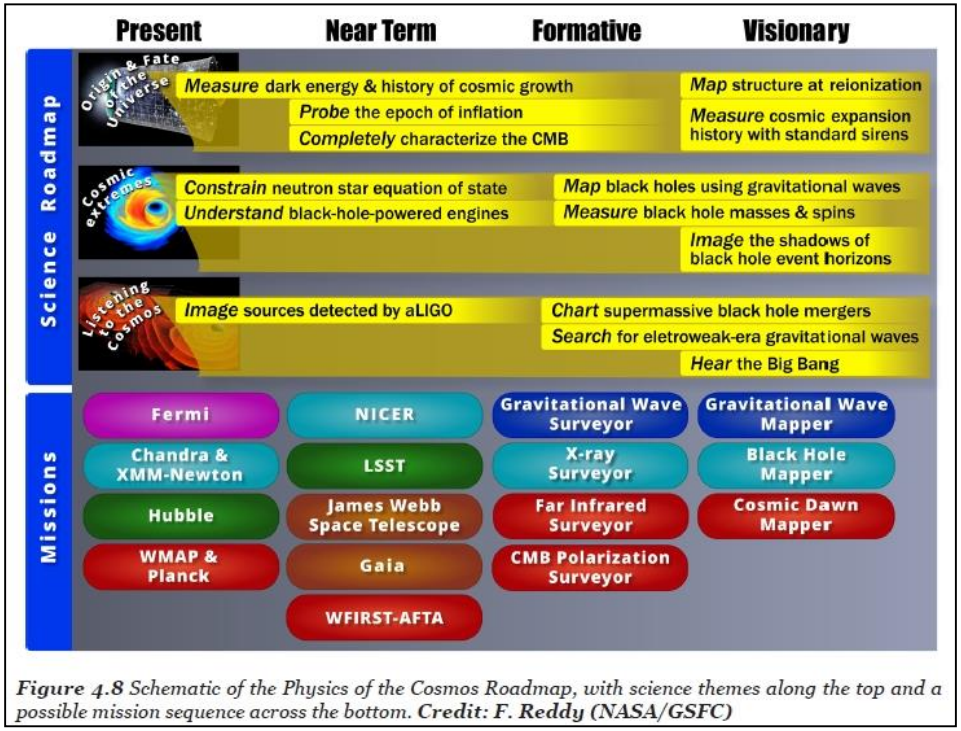


Figure 4.8 Schematic of the Physics of the Cosmos Roadmap, with science themes along the top and a possible mission sequence across the bottom. Credit: F. Reddy (NASA/GSFC)

Key topics that will be addressed include:

1) ***The Origin and Growth of the First Supermassive Black Holes***
2) ***The Physics of Feedback and Accretion in Galaxies and Clusters***
3) ***Galaxy Evolution and the Growth of Cosmic Structure***
4) ***The Physics of Matter in Extreme Environments***
5) ***The Origin and Evolution of the Stars that make up our Universe.***

THE MISSING PIECE

ASTROPHYSICS

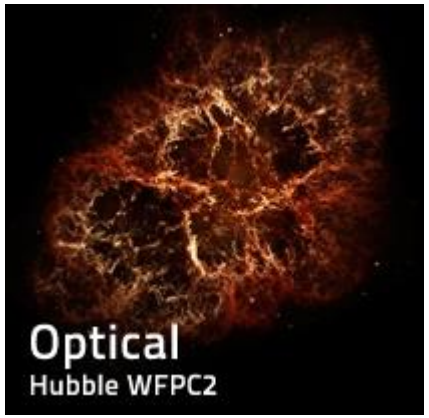
Decadal Survey Missions

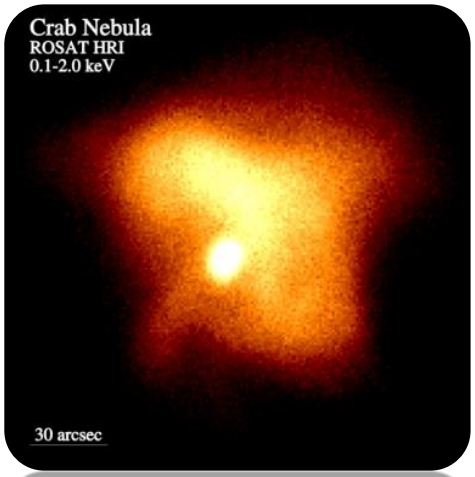
-TMT will have 144 times the collecting area of Hubble and more than 10x better spatial resolution at near-infrared and longer

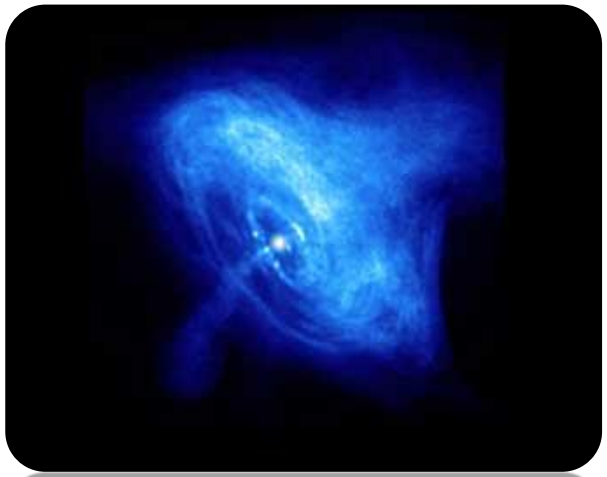
-EELT(Visible, images 16x sharper than Hubble)

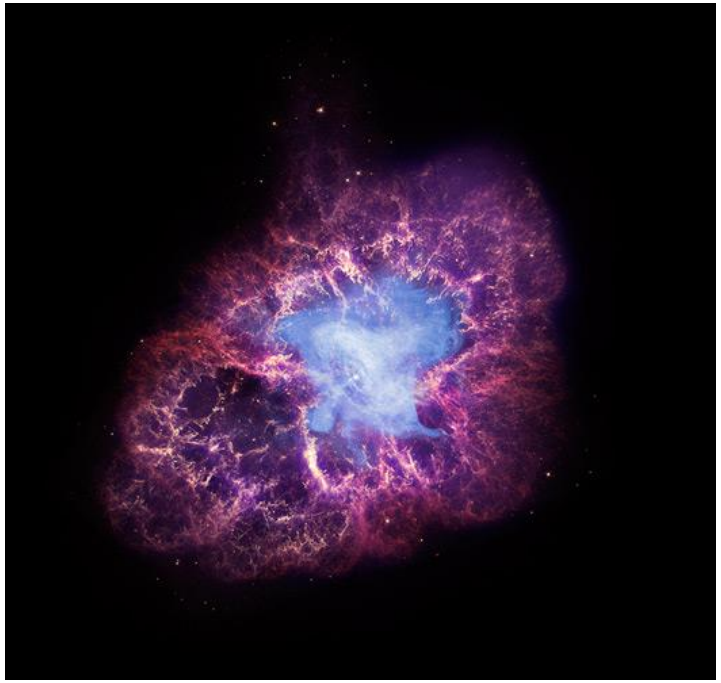
Scientifically Compelling – The Crab Nebula

Imagine a Universe without Chandra-Vision









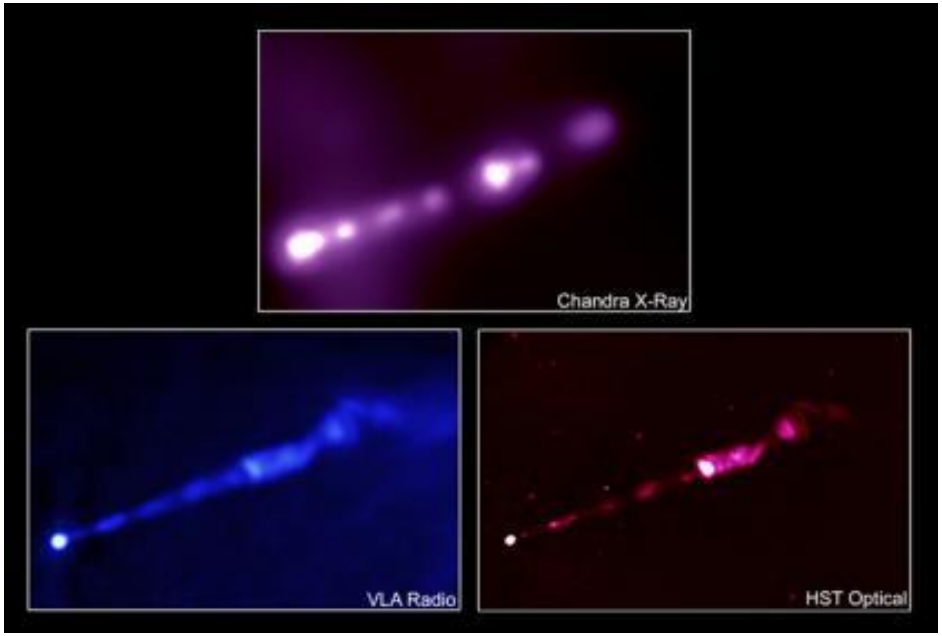
New Discovery Space

We are now in the process of defining the successor to Chandra.

30 Doradus – The Tarantula Nebula

Credit: X-ray: NASA/CXC/PSU/L.Townsley et al.; Optical: NASA/STScI; Infrared: NASA/JPL/PSU/L.Townsley et al.

M87 Jet



Credit: X-ray: NASA/CXC/MIT/H.Marshall et al. Radio: F. Zhou, F.Owen (NRAO), J.Biretta (STScI) Optical: NASA/STScI/UMBC/E.Perlman et al.

We need your input!

STDT Members

Alexey Vikhlinin, SAO (Co-Chair)

Feryal Özel, Arizona (Co-Chair)

Steve Allen, Stanford

Megan Donahue, MSU

Laura Lopez, Ohio State

Mark Bautz, MIT

Ryan Hickox, Dartmouth

Piero Madau, UCSC

Mike Pivovaroff, LLNL

Eliot Quataert, Berkeley

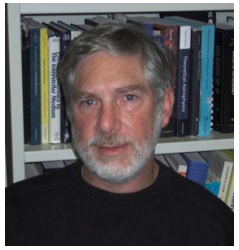
Niel Brandt, Penn State

Tesla Jeltema, UCSC

Rachel Osten, STScI

Dave Pooley, Trinity

Chris Reynolds, UMD



Joel Bregman, Michigan

Juna Kollmeier, OCIW

Frits Paerels, Columbia

Andy Ptak, GSFC

Daniel Stern, JPL

Ex-Officio Non-Voting Members Of The STDT

Daniel Evans, NASA HQ (Program Scientist)

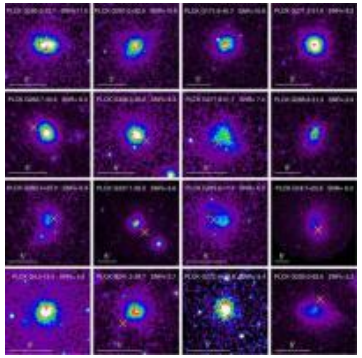
Ann Hornschemeier, PCOS Program Office Chief Scientist

Rob Petre, GSFC X-ray Lab Branch Chief

Randall Smith, Athena liaison

Paul Nandra DLR-Appointed Observer

Brian McNamara CSA-Appointed Observer



Gabriel Pratt CNES-Appointed Observer

MSFC AND SAO STUDY TEAM LEADERSHIP

Smithsonian Astrophysical Observatory

NASA

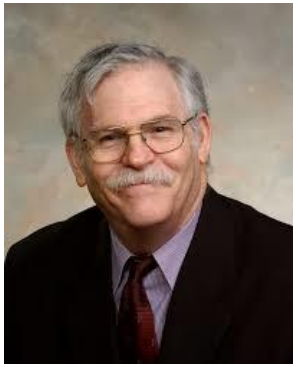
SRO Science Research Office

Alexey Vikhlinin,
SAO, STDT Co-Chair

Jessica Gaskin,
MSFC, Study Scientist

Gregg Gelmis
MSFC Study Manager

Harvey Tananbaum
SAO Senior Scientist



Martin Weisskopf
MSFC Senior Scientist

Doug Swartz
USRA/MSFC
Deputy Study Scientist

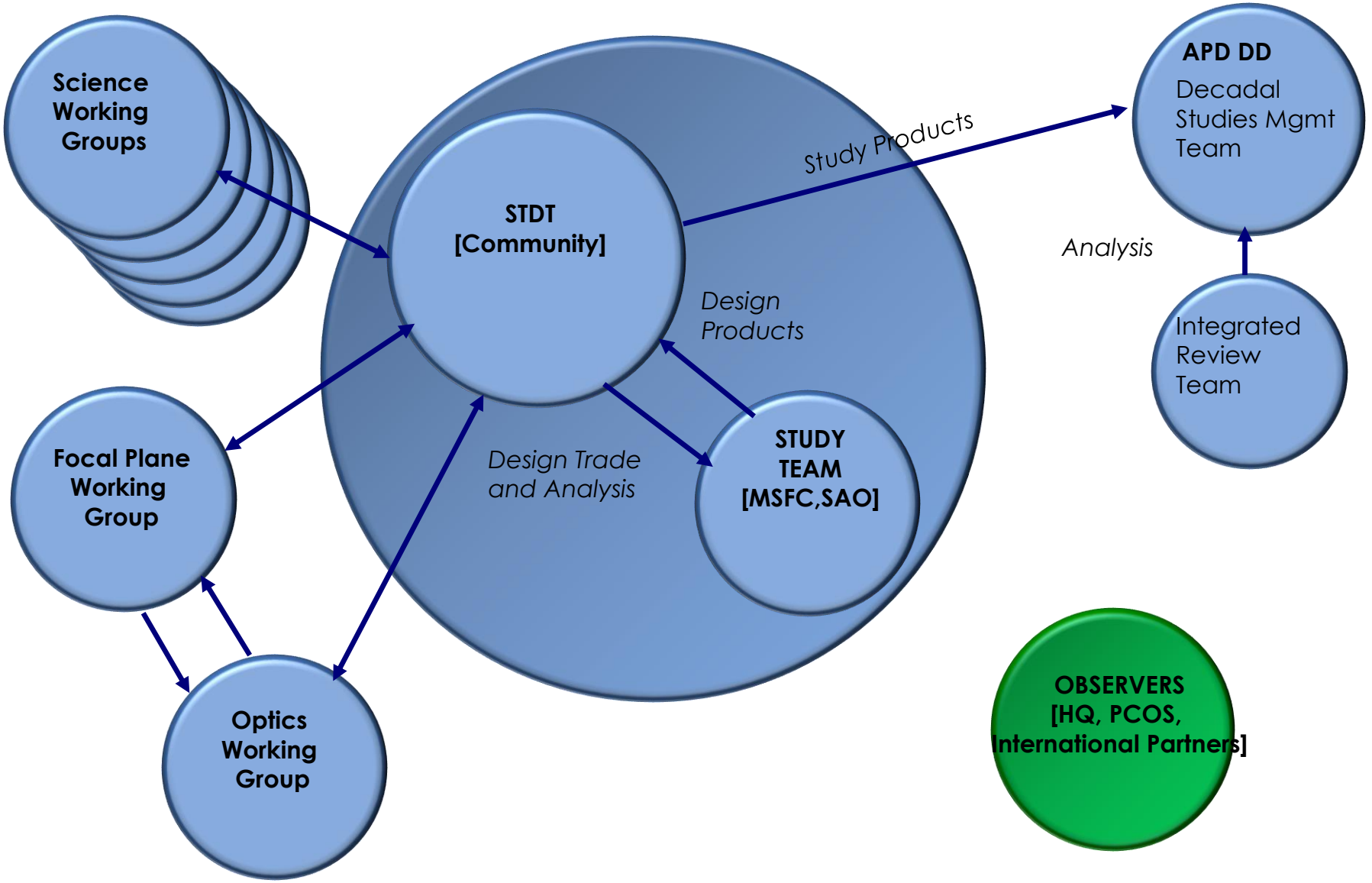
STDT Deliverables

Study output will provide the Decadal Survey Committee with:

1. A **science case** for the mission
2. A **notional mission** and observatory, including a report on any tradeoff analyses
3. A **design reference mission**, including strawman payload trade studies.
4. A **technology assessment** including: current status, roadmap for maturation & resources
5. A **cost assessment** and listing of the top technical risks to delivering the science capabilities
6. A **top level schedule** including a notional launch date and top schedule risks.

Concept Maturity Level 4 should be achieved by the end of the study

STDT And Management Structure



STDT Near-Term Plan & Task Summary

STDT Kickoff Meeting was held March 30, 2016

Near-Term STDT tasks include:

1. Deciding on the structure and mechanics for the Working Groups
2. Sketching out high-level science prioritizations and a path forward
3. Determining potential technology gaps for input into SAT and APRA
4. Outlining a Study Plan for the next couple of years

Community Participation

Informal X-Ray Optics Working Group

- Workshop March 28-29, 2016, University of Maryland
- Participants included a mix of government, university, industry:
    - MSFC
    - GSFC
    - Harvard-SAO
    - Ames
    - MIT
    - LLNL
    - Reflective X-Ray Optics
    - University of Maryland
    - Izentis, LLC
    - Northwestern University
    - Other

X-Ray Vision Science Workshop

- Workshop October 6-8, 2015, Washington DC
- Participants included ~100 participants from multiple universities and institutions
- http://cxc.harvard.edu/cdo/xray_surveyor/

Presentations and Brainstorming session white paper “X-ray Surveyor Discussion Session Results from the X-ray Vision Workshop” (*Editors*: G. Fabbiano, M. Elvis) are available on the website.

Community Participation

Your participation is fundamental to the X-Ray Surveyor mission top prioritization in the 2020 Decadal Survey.

- Science Working Groups (formal and informal)
- Technology Working Groups (formal and informal)
- Workshops and Conferences
- Public Website (questions/suggestions-distribution list/newsletter)
- Requests for Information (RFIs) regarding relevant technologies
- Outreach (web-based Q&A, AAS "Future in Space" series of Hangouts-May 20)

Public Website: https://science.msfc.nasa.gov/xrs (under development)

RFI: FedBizOpps.gov
https://www.fbo.gov/index?s=opportunity&mode=form&id=1bf3012cd8ca08464890066b68623bdc&tab=core&_cview=0